AIDS TO MEDICAL TREATMENT

by

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PREFACE TO THE FOURTH EDITION

THE present edition like its predecessors offers a concise and up-to-date summary of current medical therapeutics and again every effort has been made to retain its character as a useful working tool

Because of the ever increasing cost of production it was essential to reduce the size of the book, and special sections like dermatology and dietetics have had to be left to other volumes

I am indebted to many colleagues for suggestions and corrections Dr John A Weaver revised the Tropical Diseases section and Dr Norman L Wright gave valuable assistance with the Infectious Diseases section Messrs J H Restrick and G E McIlhagger in charge of Pharmacy at the Royal Victoria Hospital have as usual kept a firm eye on the posology Dr Patrick Gorman has done yeoman service in proof reading and providing material on new methods and I am very grateful to him

The Publishers have as always afforded every assistance and encouragement and I am filled with admiration for the very expert way in which the Aberdeen University Press have deciphered an unusually cryptic manuscript

T H CROZIER

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CHAPTER I

CHEMOTHERAPY ANTIBIOTICS

Sulphonamides

Domagk drew attention to the bacteriostatic properties of sulphonamido-chrysoidin in 1935 His experimental work found clinical application in the use of sulphanilamide in puerperal sepsis The brilliant results obtained in this field led to the elaboration of substituted compounds of *p*-aminobenzene sulphonamide The original compound showed selective bacteriostatic activity against hæmolytic streptococci and coliform organisms later members of the series added to the list of bacterial infections which were controllable Some have the further advantages of lessened toxicity slower excretion or where an intestinal bacteriostatic effect is required, lessened absorption. With the exception of this last group sulphonamides are rapidly absorbed from the small intestine and attain maximal blood concentration in about three to six hours In order to maintain a bacteriostatic level in the blood it is therefore necessary to give the older preparations at four to six hourly intervals Sulphonamides diffuse well into the tissues and this facility is of particular importance in treatment of meningeal infections where the concentration in the cerebrospinal fluid is about seven tenths of that in the blood

Sulphonamides are excreted by the kidney after partial detoxication by the liver to an acetylated form which is not bacteriostatic and is comparatively insoluble The rate of excretion varies according to the integrity of renal function and depends on the rate of urinary flow rather than on blood concentration During transit through the renal tract sulphonamides are present in the urine in considerably higher concentration than in the blood (roughly thirty fold) hence their marked urinary antiseptic action in comparatively small dosage There is danger of crystalluria and blockage of the

renal tubules, leading to anuria Adequate fluid and alkali intake is therefore of cardinal importance during administration of these drugs

If a mixture of sulphonamides be used instead of a single preparation this mixture by virtue of the different solubilities of the constituents and their acetyl products will not easily produce crystalluria. Blood concentration and therapeutic activity are enhanced by sulpha-combination It has been found that a mixture of sulphadiazine sulphathiazole and sulphamerazine (Trisulphonamide Tablets B N F) is better than a combination of any two of these drugs Cremotresamide (Sharp & Dohme) is a palatable suspension for children in which sulphathiazole is replaced by sulphacetamide

The rapid disinfectant action of sulphonamides in the blood stream is not yet understood but the reaction is a bacteriostatic one with *p*-amino-benzoic acid as the essential link This substance is necessary for the survival of micro-organisms and sulphonamides appear to compete with them for it Direct chemical antisepsis counts for little and there is neither increased immunological response nor recognisable phagocytic hyperactivity

It is essential that sulphonamides be given in full dosage for a sufficient length of time otherwise there is danger of the infecting organism becoming sulpha resistant this has been shown to occur frequently with certain organisms *e g Neisseria gonorrhœæ*

There is no evidence that a synergistic effect follows the combined administration of sulphonamides and specific antisera In cerebrospinal meningitis Mitman s statistics suggested that combined treatment yields less favourable results than sulphonamides alone

Toxic effects of sulphonamides 1 *Headache depression nausea and vomiting* These may be prominent with sulphapyridine and appear at the beginning of treatment On account of these symptoms this drug has been largely supplanted by newer members of the group Vomiting leads to dangerous dehydration but may be minimised by giving the tablets powdered and suspended in milk or glucose and water It is a sound rule to give twice the dose of citrate or

bicarbonate of soda with each administration. The fluid intake should be maintained at 4-6 pints daily and if there is excessive fluid loss through vomiting diarrhœa or sweating a substantial increase is indicated Active delirium or frank psychosis sometimes complicates sulphonamide therapy and the drug must be withdrawn

2 *Hæmaturia and oliguria* are manifestations of mechanical and reactive obstruction from crystal deposition in the renal tubules and pelves With the exception of sulphadiazine the newer compounds rarely cause trouble of this sort Administration of the drug should cease and fluids and alkalis be given by mouth The condition may progress to tubular necrosis and anuria which are unresponsive to these measures and require the treatment outlined on page 194

3 *Drug fever* may present during the late stage of treatment by sulphonamides and be mistaken for a relapse

4 *Cyanosis* is harmless it may be due to methæmoglobinæmia or rarely to sulphæmoglobinæmia

5 *Skin rashes* may appear during or after treatment the commonest being a morbilliform eruption. Rashes resembling erythema nodosum are sometimes seen seven to twenty days after completion of treatment. Polyarteritis nodosa is believed to follow sensitisation by sulphathiazole Careful watch should be kept on the blood counts of patients who have shown dermal sensitivity

6 *Hæmatological complications* Acute hæmolytic anæmia with or without jaundice leucopenia and agranulocytosis have resulted from treatment by these drugs

Cross sensitivity Dosage or contact with a chemical may sensitise the individual to it and to many other related but dissimilar compounds Drugs containing a *para* amino grouping are particular offenders in this respect Cross sensitivity between local anæsthetics aniline dyes saccharin sulphanilamide and accelerators used in rubber manufacture has been reported Procaine and its penicillin salt sulphonamides PABA and PAS are common therapeutic currency today and there is the likelihood of pre sensitisation by hair dyes, sunburn lotions etc It is thought that dermatitis and

granulopænia arising after sulphonamides may be due to cross sensitisation rather than intrinsic sulphatoxicity

Parenteral administration Sodium salts of sulphadimidine (Sulphadimidine Sodium Injection B P) sulphamerazine sulphathiazole and sulphadiazine are soluble and may be given by deep intramuscular or (better) intravenous injection They are alkaline and irritant but are very useful for the initiation of treatment in serious cases in unconscious *patients or where uncontrollable vomiting frustrates oral* medication In cerebrospinal fever much depends on securing rapid action of the drug and one third to half of the loading *dose should be given into a vein*

These preparations must not be injected into the theca or other serous cavity They may be given undiluted deeply into the buttock for intravenous use they should be diluted to 20 ml with distilled water and introduced slowly Adequate fluid intake is as important with injected as ingested sulphonamides

Local application The more soluble sulphonamides have been used on infected skin or connective tissue lesions Sulphacetamide forms a non irritant sodium salt and 10 30 per cent solutions are used in ophthalmic and nasopharyngeal work Powders containing potassium penicillin and a sulphonamide have been found valuable in treatment of infected wounds ulcers and pyogenic dermatoses Care should be taken to minimise contact with surrounding healthy skin

Sensitisation is common with prolonged local application and a spreading eczematous rash on the skin surrounding the site of application is the first sign Catastrophe may attend subsequent local or general administration of sulphonamides and indiscriminate topical use is therefore to be deprecated

Organisms Sensitive to Sulphonamides

Hæmolytic streptococci Pneumococci *Esch coli N gonorrhϾ N meningitidis H pertussis* and *influenzæ* (some strains) *H ducreyi Sh dysenteriæ*

With regard to sulphonamides which are used for their bacteriostatic action in the bloodstream sulphanilamide is as good as the newer preparations against streptococcal and

coliform infections In practice the choice lies between sulphadiazine sulphadimidine sulphamerazine and sulpha furazole These are comparatively slowly excreted allowing smaller dosage or longer intervals once the initial effect has been achieved This is true especially of sulphamerazine Sulphadimidine and its acetyl derivatives are freely soluble and do not crystallise readily Sulphamethoxypyridazine (Lederkyn Lederle Midicel P D) a recent introduction is excreted slowly and is effective in small dosage (0 5 G twice on the first day and once daily thereafter)

For cases of average severity the adult dosage of sulpha dimidine is 2 G followed by 1 G four hourly for two to five days On the day after defervescence occurs the intervals may usually be increased to six hours In more serious cases this dosage should be increased by 50-100 per cent until a satis factory response has been obtained Night dosage must be insisted upon until the brunt of the infection has passed In cases of severe infection 1 2 G of an ampoule preparation should be given (diluted to 10 20 ml with sterile distilled water) intravenously at the outset and if necessary 1 G doses may be repeated intravenously at intervals of four hours until effective oral dosage can be established

For moderately severe cases in children the following dosage scheme is applicable

	0-6 *months*	6 *months* 5 *years*	5 10 *years*
First dose	0 5 G	0 5 G	1 0 G
4-hourly for 2 days	0 25	0 5	0 75
6-hourly for 2 days	0 25	0 5	0 5
6-hourly	0 125	0 25	0 5

These may be prescribed in suspension form *e g* Sulpha dimidine Mixture for Infants B P C (1 drachm = 0 5 G)

The principles governing the administration of sulphon amides may be recapitulated thus

An exact diagnosis is desirable before embarking on therapy but treatment should not be withheld for the results of bacteriological tests

Except when used prophylactically sulphonamide treatment should rarely be continued for more than seven to ten days If good response is not forthcoming within two to three days eventual success is unlikely and the case should be reconsidered

Fluid (4 6 pints daily for adults) and alkali intake must be ensured

The urinary output must be watched and a test for albumin made daily

The leucocyte count must be watched when large doses have been given or signs of sensitivity have appeared The smaller the daily dose the less likely is sensitisation to arise regardless of the duration of treatment

The poorly absorbed sulphonamides Succinylsulphathiazole and phthalylsulphathiazole exert a bacteriostatic action on the intestinal flora without achieving effective concentration in the blood They have some utility in bacillary dysentery infective enteritis and ulcerative affections of the colon Combination with sulphadiazine gives better results In colonic surgery the risk of infection from leakage of bowel content is ever present by the use of these drugs the bacterial count of the stools may be markedly reduced A popular antibacterial routine for bowel surgery is a succinyl sulphonamide for seven days pre operatively with streptomycin on the last two days and a phthalyl sulphonamide post operatively Neomycin is also effective for this purpose

Average adult dosage

Succinylsulphathiazole 16 G then 3 G four hourly (Absorption less than 5 per cent Causes liquid stools of small bulk)

Phthalylsulphathiazole 3 G and 2 G six hourly for two days then 1 1 5 G six hourly for four to six days (Absorption less than 5 per cent More actively bacteriostatic than the above mentioned Does not tend to liquefy the stools and is therefore more effective in dysentery) *Phthalylsulphacetamide* In similar dosage

Prophylactic use Sulphonamides have been used over periods of weeks or months for prevention of upper respira

tory infections particularly in rheumatic subjects Penicillin is now considered to be a better prophylactic but good statistical results have followed the administration of sulphadiazine 0 5 1 G daily throughout the winter months in rheumatic cases Toxic skin and bone marrow reactions have been rare

Penicillin

The series of brilliant researches which culminated in the commercial production of penicillin originated in an observation by Fleming in 1928 that a portion of a blood agar plate which had been accidentally contaminated by spores of a mould *Penicillium notatum* contained a diffusible substance which was markedly inhibitory to the staphylococcus with which the plate had been seeded and filtrates were found to be no more toxic to living tissues than the broth medium in which the mould had been grown The problem of concentrating penicillin was taken further by Florey who achieved thousand fold concentrations and demonstrated its *in vivo* antibiotic virtue

Penicillin is an organic acid which has been synthesised but commercial manufacture is by extraction from cultures of *P notatum* The several forms of penicillin differ slightly in structure and in antibacterial activity The free acids are unstable in aqueous solution hence the use of their sodium salts which are freely soluble and relatively stable Pharmaceutical preparations are made almost entirely from benzyl penicillin salts and the sodium salt has a potency of over 1 600 i u per mg

Penicillin is unstable in the presence of heat moisture acids and alkalis and is inactivated by the enzyme penicillinase which is elaborated by certain bacteria Only redistilled sterile water should be used as solvent and great care taken to avoid contamination of the solution The sodium salt is hygroscopic and calcium and potassium salts are therefore used in preparation of tablets powders etc

Penicillin acts by preventing synthesis of a component of the bacterial cell wall It exerts a powerful bactericidal influence on micro-organisms particularly during the phase of active growth and multiplication possibly by interfering

with the availability or assimilation of essential nutrients such as the sulphydryl groups of certain amino-acids

The question of sensitivity and resistance to antibiotic drugs is a difficult one With regard to penicillin some organisms such as certain streptococci and pneumococci appear to retain their sensitivity indefinitely and infections with these can be controlled with the usual blood concentrations of the drug (about 0 10 i u. per ml) whereas with other organisms *e g Str viridans* a four fold concentration may be necessary Induced resistance has been noted in the case of *Staphylococcus aureus* and there has been a progressive increase in penicillin resistant strains encountered in hospital in patient practice

Superinfection. It has been found that when considerable clearance of organisms results from antibiotic therapy unusual and resistant flora may appear doubtless as a result of symbiotic imbalance Coliform organisms and fungi are commonly found in the respiratory tract following penicillin therapy and fatal staphylococcal enteritis has followed successful tetracycline therapy

Combination of antibiotics Antibiotics may be divided into two groups

1 *Bactericidal drugs* Penicillin streptomycin neomycin bacitracin Sulphonamides although not bactericidal have synergistic affinities with this group

2 *Bacteriostatic drugs* Chloramphenicol and the tetracyclines

Pairs of drugs from the same group or from both groups may exhibit additive synergistic or antagonistic activity Those in the first group usually show a synergistic effect and in clinical practice penicillin has been found effective in combination with streptomycin and with sulphonamides for infections resistant or partially sensitive to each alone Drugs of the second group usually show an additive action which ordinarily is of little advantage Combinations of pairs from different groups produce variable results depending on whether the infecting organism is sensitive to the bactericidal or the bacteriostatic drug In the first case the effect is antagonistic as the bactericidal drug acts only against multiplying organisms while bacteriostatic preparations inhibit growth

in the second if the organism is inhibited by very large doses of the bactericidal agent the combination will show a synergistic response In general it is undesirable to combine agents of different groups nevertheless it is likely that each antibiotic has its own particular mode of attack and in highly resistant cases it would seem rational to use them in series and in descending order of preference

Blood levels Duration of antibiotic effect After a normal intramuscular dose of benzylpenicillin the concentration in the blood rises steeply but falls below the useful therapeutic level in about four hours A dose of the order of 1½ mega units will give an effective concentration for about twenty four hours Much ingenuity has been expended in prolonging the therapeutic blood level although it is not certain that this is necessary in all cases

Attempts have been made to prolong effective penicillin blood levels by the use of blockade substances which hinder excretion of the antibiotic by the renal tubules A propylsulphamyl benzoic compound (Benemid Sharp & Dohme) has proved an efficient adjuvant to high level dosage with penicillin in septicæmic states such as *Str fæcalis* and staphylococcal endocarditis where conventional antibiotic therapy had failed. Dose 0 5 G six hourly orally

Crystalline penicillin (2 8 mega units daily) by three hourly intramuscular injection is used for serious infections *e g* septicæmia meningitis For a case of moderate severity the choice lies between crystalline penicillin (1 2 mega units daily) intramuscularly and daily or twice daily injection of a prolonged action preparation such as a procaine potassium salt which is relatively insoluble and maintains an effective serum level for about sixty hours The usual dose is 300 000-600 000 i u daily

Phenoxymethylpenicillin (Penicillin V) is stable and resistant to gastric acidity and is consequently reliable by the oral route Combined with probenecid (Benemid) high and sustained serum levels are reached despite the fact that urinary excretion amounts to only 25 per cent of the ingested dose Penicillin V (*e g* Distaquaine V K) has obvious advantages in children and many adults Its use has not been routine in the most serious infections although E L Quinn

have given good results in *H influen æ* meningitis in meningitic states intrathecal streptomycin medication may be desirable initially in addition to systemic dosage

Resistance to streptomycin is developed by all micro-organisms with great facility so that its use has been abandoned where any other antibiotic will serve and its main role is in tuberculous infections Resistance can be delayed by employment of adjuvant drugs such as *para* aminosalicylic acid the thiosemicarbazones and isoniazid Adult dosage is *1 G daily by intramuscular injection this is optimal* as regards good therapeutic response with minimal toxicity

The Tetracyclines

Chlortetracycline Aureomycin combines relative freedom from toxicity with a wide range of antibiotic activity It has proved effective against Gram positive and Gram negative organisms as well as viral and rickettsial agents and it possesses a further advantage of activity by the oral route Most of the organisms shown as sensitive to penicillin and streptomycin are sensitive to tetracyclines also The drug is particularly useful against *Staphylococcus aureus* and *Str fæcalis* and hæmophilus infections usually respond Good results have been reported in virus and rickettsial infections in tularæmia actinomycosis and bartonellosis

This antibiotic is an effective alternative in cases when injections are undesirable where antibiotic resistance has developed or in mixed infections *e g* of the urinary tract It has been employed with success in severe surgical infections such as peritonitis for such intravenous administration (50 mg followed by 25 mg six hourly for six days) is indicated in addition to mouth dosage For cases of moderate severity the adult oral dose is 0 25 G six hourly (children 10-15 mg per kg body weight) for seriously ill patients double dosage should be used for a few days and perhaps one or more intravenous priming doses Chlortetracycline is used locally for ophthalmic inflammatory conditions and ointment and drops are available

Toxic effects are slight nausea abdominal cramps and diarrhœa leading to eczema of the perianal region have been encountered (staphylococcal or monilial superinfection)

Raw tongue and sore mouth are frequent complications of oral antib otic therapy These side effects are lessened by vitamin B and C concentrates buttermilk youghurt and lactic cheese Enpac Lloyd Hamol is a very useful acidoph ilus preparation which contains antibiotic resistant strains

Oxytetracycline 'Terramycin was isolated by Finlay from cultures of *Streptomyces rimosus* This substance po sesses similar therapeutic properties to the other tetracyclines It is active against coccal infections and appears to have a useful rôle in staphylococcal streptococcal and pn umococcal infections It has been given with success in virus pneumonia brucellosis spirochætal and rickettsial infections and gonor rhœa Surgical infections such as peritonitis and gas gangrene are reported amenable to its action Like the other broad spectrum antibiotics oxytetracycline does not readily induce bacterial resistance Another feature common to the group is chemical stability much of the ingested dose is active in the intestine causing effective clearance of pathogen c and other flora

Toxic effects are of the usual oro-gastro-inte tinal variety

Oxytetracycline is available as hydrochloride and oral dosage is of the order of 10-15 mg per kg body weight daily in fractional doses at six-hourly intervals (for the averag adult 1 2 G daily) Ampoules for intravenous therapy are available (250 and 500 mg) and they may be added to intravenous drips in cases of overwhelming infection and where the inte tinal side-effects would be undesirable Local applications have been used in ophthalmic practice

Tetracycline Achromycin represents the molecular struc ture common to chlortetracyclin and oxytetracycline and has been prepared by dehalogenation of the former drug and by mould culture The activity pattern of the three tetra cyclines is essentially similar although they differ in chemical stability complete cross-resistance has been noted between them *in vitro* Adult dosage 250 mg tetracycline hydro-chloride orally six hourly The drug is well tolerated intraven ously It causes less intestinal upset than the others

Chloramphenicol Chloromycetin was obtained from *Streptomyces vene uela* cultures by Ehrlich and Burkholder in 1947 and was later synthesised Like the tetracyclines

chloramphenicol is a broad spectrum antibiotic active against many Gram positive and Gram negative pathogens as well as viral and rickettsial organisms It is particularly valuable in treatment of infections of the typhus and typhoid groups Good results have followed its use in salmonella and dysenteric conditions pertussis urinary infections pneumonia (coccal and viral) relapsing fever *H influenzæ* meningitis psittacosis and lymphogranuloma venereum Chloramphenicol is rapidly absorbed from the bowel widely distributed in the body tissues and excreted by the kidney It appears in effective concentration in the cerebrospinal fluid being excreted in an inactive form in the bile and urine it is not a useful agent against infections of these media

Side effects are nausea flatulence and diarrhœa Angular stomatitis and desquamative glossitis are not uncommon Anal and vaginal irritation occasionally occur as with the tetracyclines These manifestations are believed to be due to superinfection with fungi mostly *Candida albicans* Toxic effects on the bone marrow have been reported ranging from mild anæmia to agranulocytosis and aplastic anæmia These have appeared mostly in patients who have had repeated courses of the drug

Chloramphenicol is effective as a topical medicament particularly in otitis media and mastoid wounds Solutions in propylene glycol for aural use and drops for ophthalmic use are available Oral dosage adult 0 25 G six hourly for five days larger amounts may be necessary in severe infections *e g* typhoid The drug has a bitter taste hence the popularity of Chloromycetin Palmitate P D a pleasantly flavoured suspension containing 125 mg per ml Ampoules are useful in emergency (intravenously 2 ml = 0 5 G)

Polymyxin

This includes five related polypeptide antibiotics derived from cultures of *Bacillus polymyxa* of which three like most antibiotics of bacterial origin are nephrotoxic Polymyxin B and E are largely free from this disadvantage Their action is bactericidal and acquired resistance is not of practical importance Polymyxin B is in commercial production It has been proved effective against *Ps pyocyanea* which may

be pathogenic in burns and has become a common residual infector after use of other antibiotics Its action is less marked against Proteus Pseudomonas and Coli aerogenes infections of the urinary tract Dosage is 2 5 mg per kg body weight intramuscularly daily according to the integrity or otherwise of renal function Topical application is useful for burns and superficial infections

Erythromycin

Isolated from a soil organism (*Streptomyces erythreus*) this medium spectrum antibiotic is effective against most Gram positive invaders also neisseriæ hæmophilus spirochætes and rickettsias It has therefore similar validity to penicillin although possibly more active against staphylococci and *C diphtheriæ* Oral dosage (1 2 G daily by six hourly fractions) suffices and toxic manifestations beyond gastro intestinal upset are rare Unfortunately organismal resistance is rapidly acquired and erythromycin should not be used alone in chronic infections like bacterial endocarditis and osteomyelitis Termination of the diphtheria carrier state has been reported (N Wood and P M R Hemphill 1957)

Carbomycin possesses similar but lesser activity to erythromycin and cross resistance occurs

Spiromycin Rovamycin is also related to erythromycin has a similar field of activity and cross resistance has been demonstrated

Oleandomycin Matromycin is similarly related and has analogous effects including cross resistance

Novobiocin Albamycin also belongs to this group The dose is 1 2 G daily orally Favourable reports have arisen of its use in bronchitis pneumonia and staphylococcal soft tissue infections

Vancomycin

This antibiotic is not yet generally available and so far has been used intravenously It is reported little toxic bactericidal not productive of cross resistance and with a therapeutic spectrum similar to penicillin It may prove valuable in severe and resistant staphylococcal infections Dose 0 5 G six hourly by mouth for its oral intestinal effect or intravenously where sytemic antibiosis is required

Neomycin

A stable antibiotic obtained from cultures of *Streptomyces fradiæ* Particularly effective against *Klebsiella pneumoniæ* Hæmophilus Pseudomonas and Proteus groups Organismal resistance rarely presents and sensitivity reactions are infrequent For pre-operative intestinal antisepsis 1 G of neomycin sulphate is given by mouth four hourly for two to three days Intramuscular dosage (under skilled supervision) is used for severe systemic infections and urinary tract infections insensitive to other antibiotics *e g* staphylococci enterococci Dose not exceeding 15 mg per kg body weight daily or 1 G in all by six hourly injections Renal function should be carefully watched

Nystatin

An anti fungal preparation from cultures of *Streptomyces noursei* Has been used locally against fungal and yeast infections of the skin and mucous surfaces

CHAPTER II

INFECTIOUS DISEASES

Enteric Fever

The treatment of typhoid and paratyphoid infections is similar In this country the latter are usually of a mild nature but their importance as a Public Health problem remains

Enteric cases should as a rule be treated in isolation hospitals if circumstances demand home treatment adequate facilities for segregation and the services of a day and night nursing staff will be required The successful issue of a severe attack depends largely on skilful nursing the typhoid sufferer by reason of his long and exhausting illness requires devoted and unremitting care The nursing personnel should have had prophylactic inoculations

Comfort quiet and convenient isolation facilities are important considerations in the selection of the sick room Unnecessary furnishings and absorbent floor coverings should be removed In cool climates an open fire provides cheerful warmth and soiled wipes and dressings can be easily disposed of by burning The room temperature should be kept at 60 65 F Fresh air is important but the window openings should be screened with cotton mesh to exclude flies Visitors should not be allowed into the sick room

A single bed with a firm mattress preferably of sponge rubber or of the interlock spring type makes nursing routines easier Food utensils crockery and cutlery should be reserved exclusively for sick room use and may be sterilised after cleansing by boiling or by immersion for twenty minutes in a hot 2 per cent solution of bleach powder Soiled linen is disinfected by soaking in 5 per cent phenol for twelve hours before being washed The use of a public laundry is illegal Stools urine and sputum should be treated with a liberal amount of 5 per cent phenol or 2½ per cent

lysol or cresol for two hours before disposal Gauze wipes lint or cellulose tissues may be used instead of handkerchiefs and afterwards burnt

During the febrile stage the patient is encouraged to lie quietly and do nothing for himself but frequent changes of posture are essential in order to minimise the risk of pressure sores and pulmonary congestion The toilet of the mouth and skin must be meticulously attended to and the sacral and buttock areas should receive treatment after every bowel movement

Diet Patients usually benefit from an initial alimentary rest and this may be ensured by allowing fluids only Secway barley water albumin water home made lemonade or fruit juice sweetened with glucose should be given freely fruit jellies are a pleasant variant Fruit drops and barley *sugar promote salivation and help to maintain caloric* requirements A daily fluid intake of at least 4 pints should be aimed at

After two or three days milk may be added (2 3 pints daily) and this should be given in two-hourly feeds by day and may be plain or flavoured with tea coffee cocoa Horlick s Prosol or Benger s according to the patient s preference If milk causes colic or flatulence or if the stools show evidence of poor digestion (curds) it should be with drawn for a day or two and then given peptonised citrated or diluted with lime water

By the middle of the second week or earlier if diarrhœa is not troublesome the dietary may be gradually increased by the addition of soft foods such as Farex junket custard puddings milk shapes made with cornflour or gelatin beef tea and chicken jelly Further additions such as lightly cooked eggs pounded fish and chicken strained soups apple tomato and prune purees porridge thin slices of bread and butter with jelly preserves plain biscuits and sponge cake may now be made

When the third week is over defervescence complete and abdominal hazards safely negotiated the diet may be more liberal but still bland indeed most authorities use a high calorie diet from the outset Boiled or steamed fish minced beef sieved vegetables such as spinach carrots parsnips

cauliflowers and tomatoes may be cautiously added There after there may be gradual return to a full normal diet

The stools should be inspected daily throughout the febrile stage much useful information can thus be gained as to the suitability of the diet Abdominal pain distension frequent loose or foul stools or the presence of curd masses or un digest d food material are indications for temporary pruning of the dietary

Chemotherapy Sulphonamides and penicillin are of no value excep in treatm nt of secondary infections such as pneumonia and parotitis Impressive re ults have been obtained from chloramph nicol therapy The pyrex al period is shortened to three or four days and the duration of infectivity as judged by bacteraemic evidence to about five days Relapse occurs if the total dosag is nadequate but this is as a rule readily controllable by further treat ment Dosage 0 5 G initially and then 0 25 G two hourly orally until the patient becomes afebrile when the interval may be increased to four hours for the next five days The average medication is 16 G over six days Cases coming late to treatment how less satisfactory response and may require double dosage over the first five days The risk of perforation and hæmorrhage persists in some degree despite rapid clinical improvement an l it is important that exertion and diet be strictly controlled for several weeks after defervescence

Complications

Restlessness insomnia d lirium and hyperpyrexia may be prominent during the second and third weeks Repeated tepid spong ng i soothing and can be carried out with little dis turbance Insomnia often yields to phenobarbitone gr 1 2 but active delirium may require morphine gr ¼ with hyoscin gr $\frac{1}{100}$ subcutaneously

Constipation rarely requires active treatment and is best corrected by dietetic modification If prolonged liquid paraffin or a simple enema may be ordered

Diarrhœa cannot as a rule be controlled by astringents and should be countered by d etetic restriction If severe starch and opium enemata or gr 10 of Dover s powder may be

tried late in the evening to encourage sleep Meteorism can often be relieved by passage of a rectal tube or by a small saline enema Toxæmia may be profound and accentuated by dehydration The best treatment is an intravenous glucose saline drip (2-4 litres in twenty four hours) If exhaustion is marked, a litre of blood should precede the glucose saline

Intestinal hæmorrhage calls for reduction of the diet to sips of water and a hypodermic injection of morphine gr ¼ If at all severe or prolonged blood transfusion must be given Intestinal perforation is a most serious complication and its presence may be masked by hæmorrhage Immediate operation should be undertaken Mouth feeding is stopped and morphine given as soon as the diagnosis is estab lished Chlortetracycline by vein is most effective against peritonitis

Cardiac and circulatory failure are problems for which no adequate solution is available Raising the foot of the bed and bandaging the limbs will help to combat peripheral circulatory failure Injections of nikethamide or caffeine sodium benzoate may be given but an intravenous drip containing nordrenaline and hydrocortisone is best Pneu monia and bronchopneumonia require energetic treatment by penicillin or a tetracycline Phlebitis calls for immobilisation of the affected limb and warm packs are useful for relief of pain Carefully controlled anticoagulant therapy may be instituted provided that the risk of intestinal hæmorrhage has passed Heparin in 5 000-unit doses intravenously thrice daily for three to five days is probably safest Vein trauma may be minimised by use of an indwelling needle of the Gordh type

Convalescence

Convalescence should be slow Modified rest in bed is maintained for two or three weeks after the temperature has become normal The appetite is usually good and should be satisfied by a bland high-calorie diet on which the con valescent may regain body weight and energy A lazy holiday by the seaside or in the country will hasten recuperation

Prophylaxis

1 Notification

2 Strict isolation of patients until three consecutive weekly stool and urine examinations are negative for the enteric group of organisms P rsistence of Vi agglutinins is presumptive of the carrier state and the stools and urine should be cultured twice weekly for three weeks Disinfection of dejecta and fomates Attendants should wear rubber aprons and gloves and be conscientious in regard to washing their hands after attending to the patient Terminal disin fection of the patient and sickroom (the patient should be given a bath shampoo and complete change of clothing before being liberated) Preventive inoculation and daily observation of contacts Opinion is divided regarding the utility of inoculating contacts with T A B vaccine

3 Public Health measures include bacteriological control of water and food supplies efficient sewage disposal fly prevention search for source of infection detection and treatment of carriers Employees of waterworks dairies and personnel engaged in the handling of foodstuffs should have periodical bacteriological and serological examination to exclude the carrier state Carriers should be educated so that they may not jeopardise the lives of their neighbours If evidence of gall bladder damage is forthcoming cholecyst ectomy will often terminate the carrier state Urinary carriers are more difficult and nephrectomy may be necessary in the presence of an extensively diseased kidney The re ults of antibiotic therapy have been disappointing

4 Inoculation of exposed populations with T A B vaccine Alcoholised vaccines cause less undesirable reaction and produce better immunity than the heat treated and phenolised types They usually contain *Salm typhosa* 1 000 millions *Salm paratyphi* A and B of each 750 millions per ml

Dosage	*Adult males*	*Adult females*	*Children under 8 yrs*
Initially	0 25 ml	0 2 ml	0 05 ml
After 3 weeks	0 5 ml	0 4 ml	0 1 ml
Annually	0 25 ml	0 2 ml	0 1 ml

Dosage of phenolised vaccines is double the above

If rigidly adhered to this routine usually affords an immunity to clinical typhoid which is impregnable to all except massive infections Sub-infection with development of the carrier state sometimes occurs

5 During outbreaks of enteric drinking water and milk should be boiled and raw fruit vegetables ice cream and shellfish avoided unless their source is known to be above suspicion

Diphtheria

Factors of prime importance are early recognition of the disease absolute rest and prompt and adequate treatment with antiserum

Strict isolation must be enforced and all soiled swabs burnt Complete rest in bed in the recumbent position is desirable for two to three weeks after disappearance of the exudate in hope of preventing or minimising myocardial and neurological lesions Reading should be limited to at most two hours a day in order to rest the ocular muscles After this period the patient may be allowed to sit up in bed and a week later he may be carried to a reclining chair Next a few steps round the room are permitted and in the absence of tachycardia breathlessness or muscular weakness increasing physical activity is allowed If single cubicles or rooms are not available the patient should be moved to a clean ward after five to six days penicillin treatment to avoid reinfection and the carrier state

Diet Should be light but nutritious and varied In severe faucial infections with much concomitant adenitis swallowing may be difficult and thickened milk mixtures ice cream egg flip and jellies are given in frequent small feeds As in all fevers a high fluid intake must be maintained During the stage of resolution diet can be rapidly increased provided there is no indication of renal defect

Specific therapy Antitoxic serum is of signal value in reduction of morbidity and mortality but it must be given early in the course of the infection as diphtheria toxin once fixed in the tissues cannot be neutralised It is a sound rule that in all cases clinically suggestive of diphtheria 10 000 to 20 000 units of antitoxin should be given at the time of

taking the throat swab For the clinically or bacteriologically certain case of average severity a dose of 20 000 to 40 000 units should be given into a muscle immediately and repeated in twenty four hours if definite improvement is not obvious Severe cases including those showing extensive or poorly consolidated membrane with much faucial œdema bull neck laryngeal cases and those seeking advice after thirty six hours should have the intramuscular dose reinforced by an intravenous one as maximal serum concentration of antibody is not reached until 48 hours after intramuscular injection It is best to give an adequate dose at the outset and its size must be judged by careful clinical evaluation of the case A rough guide to antitoxin dosage is to allow 10 000 units for the nose and the same for each tonsil involved and 20 000 units each for pharynx and larynx *for each day that the disease has been present* For example 10 000 units will suffice for a primary nasal diphtheria seen on the first day but if the disease involves both tonsils and the larynx and the patient has been ill for forty-eight hours 80 000 units will be the minimum dose and a further 20 000 to 30 000 units should be added if toxæmia is severe If more than 50 000 units is required one third to half of the dose should be given intravenously In this case the possibility of anaphylactic reaction must be borne in mind and preliminary test doses of 0 25 1 and 2 ml injected intravenously at five minute intervals If no reaction results the full dose is warmed to blood heat and injected slowly through a fine needle If reaction occurs the remainder of the dose must be given into a muscle Reactions are controllable by injection of adrenaline 1 1000 5 10 minims subcutaneously and subsequent allergic manifestations such as urticaria respond to antihistamine drugs If it is necessary to give antitoxin to asthmatics or others in whom sensitivity is known or suspected it is wise to use a preliminary test dose of 5 minims hypodermically reaction is an indication for desensitisation by administration of a series of graduated doses subcutaneously commencing with 0 02 ml and ending with 5 ml at ten minute intervals

In toxic hæmorrhagic and laryngeal cases it is an advantage to add the serum to 500 ml of 10 per cent glucose in

physiological saline and administer by intravenous drip following with 5 per cent glucose saline if required Intra venous dosage is sometimes impossible in small and weakly children and the serum may be given intraperitoneally (in the mid line just below the umbilicus) Absorption is quicker from this site than from muscle Age and body weight do not affect the amount of serum required

Penicillin therapy Sensitivity of *C diphtheriæ* strains varies widely Energetic treatment at the outset (2 mega units of crystalline penicillin or 600 000 units of procaine penicillin daily) produces rapid clearance of the infecting organism and secondary invaders from the pharynx Penicillin V (0 75 1 5 G daily) and erythromycin (1 2 5 G daily) by mouth are also valuable As the damage in diphtheria is caused by an exotoxin and penicillin cannot be expected to do more than eradicate the infective focus its rôle will therefore be complementary to that of antiserum

Local treatment Has definite limitations and its energetic pursuit is to be discouraged Careful swabbing of the mouth and throat and the provision of simple mouth washes are unobjectionable When the false membrane begins to disin tegrate loose portions may be gently detached with forceps Electric or hydrostatic suction is valuable for removal of nasal or pharyngeal secretions

Laryngeal Diphtheria Associated with high mortality as the victims are usually infants and the respiratory embarrassment induces circulatory exhaustion In addition to liberal serum therapy the child should be nursed in a steam tent or ward Where these are not available a tent can be improvised with bed screens or a domestic clothes horse and sheets and the steam introduced from a boiling kettle Feeding is often difficult and œsophageal intubation may be necessary Respiratory obstruction should not be allowed to develop and laryngeal intubation or tracheotomy must be resorted to in good time If the child is being nursed at home tracheo tomy is the operation of choice as once the tube has been inserted subsequent management of the case is fairly straightforward The inner tube should be removed for cleaning at three or four hourly intervals The disadvantage

of this operation is the subsequent scarring and the possibility of injury to the larynx but the latter can be averted by incising the trachea below the first ring

In hospital operative interference may often be more tardy and aspiration by direct laryngoscopy may obviate its necessity

Complications

Cardiac and circulatory weakness should be met by strict recumbency with elevation of the foot of the bed and the use of an oxygen tent An intravenous saline drip containing noradrenaline is a most useful resource in emergency and hydrocortisone is an excellent supportive measure

Peripheral neuritis must be watched for and if it occurs rest is provided for the weakened muscles. (See p 288) Palatal paresis requires careful feeding and liquids should be thickened the use of an œsophageal tube may be necessary Pharyngeal paresis calls for elevation of the foot of the bed on blocks maintenance of a clear airway by continuous suction of secretions from the pharynx and tube feeding. Atropine hypodermically is helpful Respiratory paresis is an indication for the use of a mechanical respirator In paresis of the pharyngeal and respiratory muscles tracheotomy is advantageous in conjunction with the above methods If a respirator is not available artificial respiration and oxygen inhalation should be tried. Bronchopneumonia is a dangerous complication, and should receive energetic treatment (See p 263)

Prophylaxis

1 For preference the patient should be treated in an isolation hospital. Isolation is continued until three successive nasal and faucial swabs (taken at intervals of not less than three days and at least two days after cessation of antibiotic therapy) are negative The nasopharynx should appear healthy and free from discharge Terminal disinfection of the patient and sickroom is carried out The disease is notifiable

2 Contacts should have nasal and throat swabs taken and be Schick tested They should be quarantined until the results are available and children from an infected house are not

allowed to attend school for twelve days or until shown to be clear Those giving negative Schick tests and negative swabs are regarded as above suspicion A negative Schick test and a positive swab is an indication of the carrier state and these should be isolated gravis and intermedius strains are regarded as virulent mitis requires virulence testing A positive Schick test and negative swab means that these are at risk and should be re-examined and swabbed daily during the epidemic. Where desirable they may be protected by combined passive and active immunisation Positive Schick test and positive swab indicate clinical diphtheria

3 Convalescent and healthy carriers of virulent strains should be segregated (and kept separate from acute cases) and given ample dietary tonics sun and fresh air Nasopharyngeal abnormalities such as diseased tonsils adenoids or mastoiditis should be dealt with surgically Penicillin and erythromycin in liberal dosage are of some value in termination of the carrier state

4 The present policy of mass immunisation of children has proved conspicuously successful Immunisation is of most benefit to children between the ages of six months and six years as in this group natural immunity is lowest and the disease formerly most fatal Immunisation is therefore advocated for all children at the age of three to eight months

Purified toxoid adsorbed on aluminium phosphate (P T A P) gives a Schick conversion rate of over 99 per cent and is the preparation of choice for infant immunisation and for booster dosage of school children and adolescents Dosage varies according to the preparation employed Triple antigen (tetanus pertussis and diphtheria) gives excellent results Alum precipitated toxoid (A P T) and toxoid antitoxin floccules (T A F) are now little used Whatever the prophylactic employed *a full course with proper spacing* of the doses is essential Immunising injections should not be given in the presence of colds gastro intestinal upsets or during outbreaks of poliomyelitis

5 Temporary (passive) immunity is useful in certain circumstances as in the case of diphtheria contacts who are suffering from some debilitating disease and may be achieved by an intramuscular dose of antitoxin (4 000-8 000 units) It

is unfortunately liable to arouse a false sense of security if there are no contra indications it can be combined with a course of P T A P

Scarlatina

This disease has manifested itself in a comparatively attenuated form during recent years and the anginose malignant and hæmorrhagic types are rarely encountered The decision as to home or hospital treatment must depend upon the facilities available

Isolation and nursing are carried out as in other infectious fevers The patient should remain in bed for eight to ten days after defervescence and his return to full activity should be gradual The presence of complications necessitates longer immobilisation

Diet is restricted to fluids and carbohydrates during the febrile phase later in the absence of renal involvement light ordinary diet is allowed If the throat condition makes swallowing difficult semi solids and thickened drinks are most successful.

Local and symptomatic treatment Over active local treat ment can do harm warm saline or aspirin gargles make for comfort Hot fomentations or kaolin poultices to the neck diminish the pain and trismus associated with cervical adenitis Dover s powder and aspirin alleviate general discomfort and restlessness thus aiding sleep

Specific therapy Because of the mildness of recent epi demics it has not been easy to assess the virtue of scarlatinal antiserum and the introduction of antibiotics has further confused the issue In the light of available information it appears to be a valuable contribution to treatment Anti serum has no effect on established complications but if given early tends to prevent their appearance it effectively combats toxæmia Unnecessary in mild attacks it should be used for severe cases and in debilitated subjects The dose is 16 000-32 000 units When the upper level of dosage is indicated part should be given intravenously with due pre caution

Chemotherapy The results of sulphonamide therapy are much in doubt the rash and pyrexia are not materially

Diet Feeding presents a difficult problem in cases where the paroxysms of coughing regularly end in vomiting Heavy food is undesirable but milk should be given liberally and if fortified will maintain nutrition until the period of stress is over Custards milk puddings eggs soups and jellies are also useful Infants should be fed ten to fifteen minutes after an attack it is an advantage to reduce the bulk of the feeds temporarily adding glucose or Dextrin maltose Feeding after paroxysms may be necessary also in older children who vomit copiously in order to prevent serious undernutrition

Drugs Cough mixtures containing antispasmodics have *definite value (ammonium bromide gr 4 chloral hydrate* gr 2 tincture of belladonna and ammoniated tincture of opium of each 4 minims chloroform water to 1 drachm four hourly for a child of three years)

Phenobarbitone (gr $\frac{1}{10}$ twice or thrice daily for a child of one year) will allay apprehension and spasm but cyanosis bronchopneumonia and pulmonary collapse are contra indications

Extensive clinical tests have confirmed the efficacy of chloramphenicol in whooping cough Dosage is 50-100 mg per kg body weight daily by six hourly fractional doses When the spasms are under control the dose may be reduced by half On account of possible bone marrow toxicity enthusiasm for chloramphenicol has been partially diverted to oxytetracycline and chlortetracycline seems equally effective Antibiotics are useless unless given early in the attack

Specific therapy The use of pertussis vaccine during the catarrhal stage of the disease has its advocates but little benefit is to be expected once spasms appear Convalescent serum and hyperimmune serum (from adults who have had the disease or who have lately been immunised by vaccine) are not generally available

Complications

Bronchopneumonia accounts for most of the mortality of whooping cough and should be met by exhibition of penicillin erythromycin or a cycline antibiotic Pulmonary collapse is usually associated with bronchopneumonia and

may require postural drainage deep breathing routines and possibly bronchoscopic drainage Convulsions are best treated by warm baths and administration of a sedative such as soluble butobarbitone 0·075-0 125 G orally For severe cases withdrawal of cerebrospinal fluid by lumbar puncture oxygen inhalations and an intramuscular injection of amylobarbitone 0 075 G for a child of one year should be tried Otitis media calls for appropriate attention

Convalescence

In an average uncomplicated case the child may be allowed up on the fourth or fifth day of the paroxysmal stage and be permitted to play quietly in the fresh air a few days later Tonics and concentrates of vitamins A and D are of considerable value and a change to the country or seaside will complete convalescence

Prophylaxis

1 The patient should be isolated for four weeks from the first whoop unless the paroxysms cease and pernasal swabs become negative earlier Discharges sputa and vomitus are received into wipes or disposable tissues and burnt The first case in a household is notifiable in some areas

2 Non immune child contacts should be examined daily for three weeks and be excluded from school In view of the unreliability of immunity tests it must be assumed that all children who have not had the disease are susceptible Adult contacts are isolated only if suspicious symptoms develop Diagnosis during the highly infectious catarrhal stage is important and is facilitated by cough plates or pernasal swabs taken immediately after coughing

Immunisation Combinations of alum precipitated diphtheria toxoid tetanus toxoid and *H pertussis* vaccine are available Three or four monthly intramuscular injections of triple antigen beginning at the fourth month of age induce good temporary immunity to pertussis this can be quickly revived by booster dosage when required

Meningitis

When a case of meningeal irritation presents the many possible causes must be considered In meningitis rapidity

blood or plasma transfusion followed by saline to which noradrenaline bitartrate (L-arterenol Levophed Bayer Products) is added (one 4 mg ampoule to 500 ml of normal saline) Cortisone in dosage of 100-200 mg daily by mouth or prednisone in one fifth of this amount is excellent supportive therapy but in critical peripheral circulatory failure hydrocortisone hemisuccinate 100 mg in an intravenous drip is best Whether corticosteroids are being given or not potassium lack may supervene Careful watch must be kept on the blood chemistry and hypokalæmia corrected provided that anuria is not present

Pneumococcal meningitis responds well to combined intrathecal and systemic penicillin but sulphonamide therapy is desirable as a second line of defence

H influenzæ **meningitis** varies in its response to chemotherapy and laboratory findings on sensitivity provide a useful indication for treatment Some can be controlled by penicillin 2-4 mega units daily while other strains are vanquished by streptomycin 0 5 2 G daily by fractional intramuscular dosage for five to seven days with one or more intrathecal doses of 20-50 mg as required In general a better response is obtained from chloramphenicol therapy Prather *et al* confirm its superiority in children with *H influenzæ* and other Gram negative meningeal infections (125 250 mg four hourly for eight to ten days) Sulphadiazine should also be given in all cases

Meningitis due to *Klebsiella pneumoniæ Esch coli* Pseudomonas and the Salmonella group can be treated by a streptomycin sulphadiazine routine although laboratory findings suggest a successful role for neomycin (10-15 mg /kg daily intramuscularly) Polymyxin (2 5 mg /kg daily intramuscularly) is effective against *Pseudomonas* infections

Staphylococcal meningitis is usually difficult to control and here antibiotic sensitivity varies widely Pending laboratory indications penicillin 5 to 10 mega units and streptomycin 2G intramuscularly daily plus penicillin 15 000 units intrathecally is best If the organism proves penicillin resistant chloramphenicol (0 25 G 4 6-hourly orally until the patient becomes afebrile) with erythromycin 1 2 G orally daily should be tried

Sterile subdural collections of fluid are a late and trouble some complication of treated meningitis and they are often responsible for recurrent pyrexia and convulsions Aspiration is usually required

Tuberculous meningitis Until recently opinion was uniform that combined intramuscular and intrathecal therapy was de sirable It now appears that intramuscular streptomycin with para aminosalicylic acid or isoniazid is equally effective Streptomycin is given in dosage of 5 mg per kg body weight intramuscularly daily for about eighty days if clinical response has been satisfactory it may then be given on alternate days and later on every fourth day over a total period of about six months Isoniazid (5 10 mg per kg body weight to a maximum of 300 mg daily by mouth) or para aminosalicylic acid (5 15 G daily by mouth) is given over four to six months

Relapse may occur even after long periods of good pro gress but these have been less common where the initial course of therapy has been energetic and not of shorter duration than three months Somner advised continuation of treatment however favourable the clinical response until the C S F glucose content rises to 50 mg per cent

Intrathecal tuberculin (P P D) streptokinase heparin and more recently cortisone have been tried with the object of preventing or lessening tuberculous exudate and the risk of spinal block and hydrocephalus Results have been very variable

Lymphocytic choriomeningitis A mild meningitic illness due to a virus infection Vectors are house mice and prob ably bugs and lice also The C S F is sterile on culture but shows a marked lymphocytic pleocytosis

Prophylaxis of Meningococcal Meningitis

1 Hygienic living conditions adequate air space heating and ventilation of dormitories and messrooms

2 Isolation of patients The disease is notifiable Detection of carriers by post nasal swabbing In small closed com munities, mass prophylaxis is by dosage with 4 G sulphadiazine ov r twenty four hours This may clear carriers temporarily

Psittacosis

A virus infection of parrots budgerigars pigeons and hens which is communicable to man Newly imported birds of the parrot family are very likely to harbour the disease which appears in humans as an influenzal illness with pulmonary consolidation The tetracyclines are effective (0 5 G orally followed by 250 mg six hourly until defervescence) Chloramphenicol may be used in similar dosage

Influenza

The many dissimilar diseases grouped under this heading require prompt and energetic treatment as their importance lies mainly in dangerous complications and sequelæ

It is wise to insist upon complete rest in bed until the temperature has been normal for three days and the patient is free from complications

For mild cases a light diet with ample fluids an aperient and a few doses of Compound Codeine Tablets B P may be all that is required further treatment is symptomatic on lines described for the common cold (p 252) In more severe cases sulphonamides are usually given sulphadiazine sulphadimidine and sulphafurazole are all suitable These have no effect on the virus infection but may help to forestall or ameliorate complications caused by the activity of bacterial invaders

The irritating cough of influenzal tracheitis can be lessened by steam inhalations containing some aromatic substance such as Friars balsam and a few doses of Codeine Linctus B P C The gastro-intestinal manifestations are often distressing here fluid diet chalk and opium mixture and warmth to the abdomen are helpful but for obstinate diarrhœa one of the little absorbed sulphonamides may be given trial

Bronchopneumonia is a common and dangerous complication and calls for efficient treatment (see p 263) Tonsillitis and sinusitis must be treated *secundum artem*

Myocardial weakness sometimes complicates a severe or neglected attack of influenza Neuro-circulatory asthenia may occur in predisposed subjects and all shades of psychi

atric defect may be uncovered Such troublesome sequelæ can often be avoided by securing adequate convalescence for the patient Tonics play a minor role but iron and strychnine mixtures and vitamin preparations are often ordered for the asthenic sequelæ

Prophylaxis

1 Sufferers should be encouraged to remain solitary in the early stages of the attack The use of disposable tissues and separate tableware and towels should be encouraged

2 During epidemics avoidance of crowded gatherings abundance of exercise in the fresh air correction of unhealthy oronasal conditions Disinfection of the air in theatres etc with aerosol sprays of hypochlorite or propylene glycol or by U V radiation.

3 Specific Immunisation with appropriate endemic virus strains has given promising results American figures suggest that 75 per cent of those inoculated escape attack The antibody response following infection or following inoculation wanes after two months so that repeated dosage at yearly intervals is probably adequate Inoculation during an epidemic is useless one valuable activity of W H O is the prediction of outbreaks

Poliomyelitis

The aim of treatment is to minimise the effects of muscular paralysis Early diagnosis is a matter of great difficulty in many cases as mild subclinical infections are common The possibility of poliomyelitis should be considered in all cases of unexplained pyrexia particularly when the disease is prevalent and all short term febrile illnesses treated by total rest. There is good evidence that muscular fatigue or trauma during the invasive stage aggravates the paralysis

The patient should be isolated and given complete rest A firm mattress support is necessary to prevent sagging of the spine which would be disastrous if the trunk muscles should become affected The bed should be equipped with a foot board Diet suitable to the febrile state is given, and ample fluids allowed. Lumbar puncture should be done as a diagnostic aid and to lessen meningeal irritation Headache and

muscle pains are relieved by aspirin or its combinations with codeine or Dover s powder but restlessness and insomnia may require phenobarbitone Retention of urine sometimes occurs and should be relieved by catheterisation Apart from symptomatic indications drugs have no influence on the course of the disease Convalescent serum had a short vogue but its value has never been demonstrated

In the pre paralytic stage painful and tender limbs should be made comfortable by the use of bed cages pillows and sandbags The application of heat as by radiant heat baths hot packs or stupes makes for comfort and mental tran quillity Many cases stop short of paralysis but this mani festation must be sought for and treated with promptitude Weakened muscles should be supported by splinting the limb in a position of physiological rest to prevent overstretching and deformity Splintage should be light and easily remov able and may be made of Plaster of Paris or Perspex A plaster shell or bed is necessary where muscles of the trunk or buttock are weakened

Involvement of the bulbar nuclei is a serious manifestation and its care makes most exacting demands on the skill and patience of the nursing and medical personnel Accumulation of pharyngeal secretions leads to pulmonary atelectasis and pneumonia and must be prevented by (1) postural drainage (a 30 50 angle of elevation of the trunk and lower limbs but 20 will suffice if the patient can be nursed in the lateral and/or prone positions) (2) continuous suction (3) feeding by pernasal gastric tube (4) oxygen by mask (4 8 litres per minute) (5) mechanical respirator If a clear airway cannot be maintained by these measures high tracheotomy may prove life saving A simple closed circuit oxygen inhaler which incorporates soda lime absorption should be available for bulbar cases showing defective deglutition and cough reflex and pooling of pharyngeal secretions in conjunction with items 1-4 above Respiration is assisted by rhythmic compression of the rubber bag A cuffed rubber tube is passed through a tracheotomy incision thereby closing off the hypopharynx The tank respirator is reserved for cases of spinal type respiratory paresis All forms of mechanical respirator are dangerous unless items 1 3 are put in train

Bronchopneumonia is liable to supervene and must receive treatment by penicillin or broad spectrum antibiotic

Active physiotherapy ought to be introduced just as soon as the stage of muscular tenderness has passed The application of heat is continued with in order to maintain good peripheral circulation Limbs that are allowed to become cold and clammy rarely regain good function Hot stupes limb baths radiant heat and short wave diathermy are helpful Light massage is beneficial and passive movements of the joints of the affected region should be made daily to prevent stiffness and contracture After a few days the position as regards paralysis usually becomes stabilised and more ambitious physiotherapeutic measures can be employed Good food sunlight and fresh air are powerful stimuli to recovery and boredom must be prevented by the provision of suitable bed recreations It is wise to secure the co-operation of an orthopædic surgeon from the outset and the services of a skilled and enthusiastic physiotherapist are invaluable

The electrical reactions of the muscles should be tested and charted from time to time this provides a useful guide to treatment as attention is directed particularly to those which show signs of recovery and effort not wasted on those hopelessly paralysed Good circulatory and muscle tone must be striven for and this is incompatible with prolonged immobilisation in splints These are removed daily and after preliminary heating and massaging of the affected limbs a full range of passive movements should be carried out the patient can without detriment be encouraged to assist with these movements The limb is supported so as to counteract the effect of gravity and active contraction of the weakened muscle groups performed

At this stage help may be given in the form of jointed splints supported from a frame or beam and arranged with pulleys and counterweights or springs wherein the patient can exercise the affected muscles without fatigue Later progressive exercises against gravity are introduced and finally movements against resistance Progress should be gradual as overstretching or tiring of the weakened muscles depresses morale and hinders recovery Many movements which are difficult or impossible in bed are facilitated by the

buoyancy of water and the use of an immersion pool or bath is of great service in the reablement of poliomyelitis victims

The duration of bed rest depends on the circumstances of each case most patients can be allowed up after two to three months The supporting apparatus must be modified or replaced *periodically according to progress* and the amount of exertion permitted Physiotherapeutic and re educative measures may be necessary for up to two years suitable orthopædic appliances will enable the patient to take exercise and regain ordinary activities The rationale of each item of treatment should be explained to the patient as in this affliction intelligent co-operation and self help are important factors in recovery Where feasible a stay at a polio reable ment centre is of great benefit to the individual sufferer *Orthopædic treatment e g tenotomy tendon transplantation* arthrodesis may be of service in correcting residual deformity and improving function

Prophylaxis

1 Isolation of patient and suspects (one week or dura tion of fever if longer) sterilisation of tableware and bed linen Destruction of swabs and nasal discharges by burning disinfection of fæces as in enteric fever

2 *Notification Quarantine of child contacts (three weeks)* School closure is of doubtful advantage as it may disperse potential foci of infection and increase the communal hazard on the other hand the individual scholar is safer at home than in an infected school and parents are usually given an option in the matter If the school remains open efficient daily medical inspection is a *sine qua non*

3 As the virus is carried by sewage a high standard of personal domestic and community hygiene is desirable as in prophylaxis of enteric fever During epidemic periods crowded assemblies and sports fixtures should be banned likewise bathing in swimming baths ponds and rivers In view of the possible rôle of droplet infection and naso-pharyngeal entry of the virus elective oro pharyngeal surgery should be postponed Prophylactic injections against other diseases (particularly those given intramuscularly) should be temporarily withheld

4 Protective inoculation Extensive field trials by Hammon and others showed that considerable protection is afforded by injection of gamma globulin (7 ml for a child of five years) Passive immunisation is not satisfactory except in special cases such as pregnant mothers and young child contacts Immunisation by attenuated vaccine is therefore a more desirable procedure and formolised vaccine of the Salk type is in extensive use Dosage is 1 ml intramuscularly and repeated after four to six weeks and six to twelve months Little is known as yet regarding booster dosage requirements Ideally all persons at risk should be protected but young people between the ages of six months and national service intake comprise the urgent target Many practical problems of vaccine production remain—for example where the line should be drawn between adequate attenuation (and complete innocuity) and useful antigenicity The live attenuated poliovirus vaccine of Sabin and Koprowski is given orally as separate virus strains Some difficulties in attenuation arise here also spontaneous mutation is another hazard

Encephalitis

Many different viruses including those of poliomyelitis are capable of causing this condition and the clinical findings show wide variation The cerebrospinal fluid may be normal or contain excess protein and globulin with lymphocytic pleocytosis Lumbar puncture may lessen mental excitement or coma During the febrile phase treatment is that of infectious fevers in general Chloramphenicol and the tetracclines and cortisone appear to be helpful in some cases Hypnotics such as phenobarbitone and cyclobarbitone are indicated for relief of delirium and insomnia Good nursing and careful feeding are of prime importance and the skin, bowel and bladder usually require attention. If coma is prolonged or signs of bulbar involvement appear the measures described under poliomyelitis are necessary

If muscular rigidity develops judicious physiotherapy is of value The patient is encouraged to move about and to regain his physical independence Suitable occupational therapy will help to preserve mental and muscular agility Antispasmodic drugs are useful in some cases and they

should be pushed to the limit of individual tolerance The best are atropine sulphate gr $\frac{1}{[illegible]}$–$\frac{1}{[illegible]}$ twice daily by mouth and hyoscine hydrobromide gr $\frac{1}{[illegible]}$–$\frac{1}{[illegible]}$ twice to thrice daily Tincture of stramonium in ½ 2 drachm doses is preferred by some patients (see p 310) Depressive and narcoleptic states and oculogyric crises are improved by amphetamine one to two tablets of 5 mg being given each morning Sufferers showing abnormal behaviour patterns often benefit from the re-education technique of Bond and Appel patients with serious antisocial tendencies need institutional care and psychotherapy Epidemic encephalitis is notifiable Case to case infection is rare and diagnosis in sporadic instances is often tardy isolation is therefore pointless except in epidemic conditions

Post vaccinal encephalitis and that *complicating infectious fevers e g* measles mumps and glandular fever respond to general measures outlined above There is no specific treatment and the use of immune serum has been abandoned

Morbilli Measles

Measles is one of the major scourges of child life on account of the invalidism and mortality associated with its complications and sequelæ It is moreover a disease which is often regarded with astonishing complacency by otherwise intelligent parents

Prompt isolation is desirable and the usual infectious sickroom routine established The room should be airy and comfortably warm if photophobia is troublesome the eyes should be protected from bright light for a day or two A fluid diet and a diaphoretic mixture are suitable for the febrile stage Conjunctivitis responds to three hourly irrigations with boric lotion and inunction of the lid margins with soft paraffin Laryngitis is treated by prescription of a sedative cough mixture such as Codeine Mixture for Infants B P C and moistening the atmosphere by steam from a bronchitis kettle An effective steam tent may be improvised with ward screens The steam valve and the electrically-operated steamer both have the advantage of producing steam without appreciable heat *The possibility of laryngitis in measles* being diphtheritic must be borne in mind

Bronchitis and bronchopneumonia are frequent complications especially in debilitated children and should be treated as described elsewhere There is some evidence that routine administration of sulphonamides or penicillin in all but the mildest cases will reduce the incidence of inflammatory complications Convulsions may herald the early febrile phase or later the onset of encephalitis Treatment is by sedation e g Chloral and Potassium Bromide Mixture for Infants B P C phenobarbitone gr ¼ or butobarbitone gr 1 twice daily for a child of six years Vomiting and diarrhoea may arise at any stage especially in infants and lead to profound dehydration and shock Mouth feeding should be limited to sterile water for twelve hours and intravenous fluids (including plasma) given Otitis media should be watched for and appropriate treatment instituted Stomatitis responds to gentle cleansing with sodium bicarbonate solution painting ulcerated areas with 0 5 per cent aqueous gentian violet Citrus juice reinforced with ascorbic acid is helpful in all mouth lesions Noma and cancrum oris formerly fatal manifestations are amenable to large doses of penicillin or a broad spectrum antibiotic.

Prolonged convalescence is desirable after measles particularly in cases which have shown complications Fish liver oil and iron tonics are helpful Fresh air sunshine and if possible a change to the country or seaside will do much to reinvigorate the patient A predisposition to disease of the chest or naso-pharynx may be excited by measles or a pre-existing tuberculous focus reactivated

Specific therapy Convalescent serum is of doubtful value in treatment of the established attack, but has been used to protect susceptible or attenuate the disease in contacts For temporary passive immunity it must be given within four days from exposure to infection if given between the fifth and eighth days the attack will be modified and active immunity result which is in most cases the more satisfactory state of affairs The dose of pooled convalescent serum is 5 10 ml by intramuscular injection If this remedy is not available 10-20 ml of adult immune serum may be used This is of considerably lower potency and in addition to the risk of transmitting infective diseases such as hepatitis

syphilis and malaria infection may occur in the hæmatoma formed at the injection site

Gamma globulin is separated during the fractionation of pooled human sera and is rich in many antibodies including that of measles It can be concentrated so that small doses are effective reactions are very unusual and the globulin may be heated without deterioration of its antibody con tent thereby obviating the risk of transmitting homologous serum jaundice etc The dose is 2 ml intramuscularly before the fifth day for protection and after this for atten uation in the former case the child is protected for almost four weeks

Prophylaxis

Isolation Destruction of discharges by burning disinfec tion of fomites by chemicals or steam terminal cleansing of sickroom Notification (In some areas the first case in each household is notifiable) Clinical and domestic considerations decide the question of hospitalisation Quarantine of suscept ible contacts (three weeks) all children who have not suffered from the disease are considered susceptible School closure is impracticable but susceptibles should be excluded during epidemics Passive immunisation attenuation

Rubella German Measles

This mild exanthem requires little more than isolation and general fever regime Infective complications such as otitis media sometimes arise and require routine treatment *Encephalitis* is a rare complication and should have treatment as described in the relevant section

The incidence of German measles during the first trimester of pregnancy may cause congenital malformations in the fœtus such as cataract dental anomalies cardiac lesions general hypoplasia deaf mutism and mental defect Thera peutic abortion has been considered for such cases Rubella can be transmitted experimentally with considerable regular ity and the suggestion has been made that young girls should be given the disease in rubella camps It is difficult in practice to confine an infective disease in this way

Epidemic Parotitis Mumps

Isolation and general fever routine should be arranged The patient should rest in bed for seven days after defervescence in uncomplicated cases Feeding requires considerable ingenuity as trismus is often a feature semi-solid foodstuffs such as porridge milk puddings custard puddings ice cream and jellies are more easily negotiated than liquids The mouth and tongue are cleaned with a bland preparation such as Thymol Compound Mouthwash B P C 2 drachms to 2 ounces of water after each meal Kaolin poultices to the neck will relieve pain and an analgesic such as aspirin or Tercin tablet B D H may be ordered in the evening to encourage sleep

Complications are comparatively rare in children but occasionally troublesome in adults For orchitis rest in bed and support for the inflamed testis are necessary A piece of elastoplast attached to the thighs and stretched under the scrotum forms an effective splint Stilbœstrol (5 mg daily for ten days) has been recommended as a prophylactic against orchitis in adults also gamma globulin from convalescent patients Decompression of an inflamed testis by incision of the tunica albuginea has yielded disappointing results Ovaritis should be met by rest in bed sedatives and warmth to the lower abdomen Cortisone and prednisone have been given for symptomatic relief in orchitis and ovaritis Meningo-encephalitis responds to sedatives and repeated lumbar puncture

Prophylaxis

Isolation until the patient is free of glandular swelling Observation of susceptible contacts between the twelfth and twenty-eighth days (malaise pyrexia and inflammation of Stensen s ducts are suggestive) Destruction of oronasal discharges and disinfection of tableware towels etc

Infectious Mononucleosis Glandular Fever

Treatment of this condition is mostly symptomatic Isolation and rest in bed for one week after defervescence is complete should be advised The enlarged lymph nodes are

rarely painful and as a rule subside quickly In the anginose types feeding must be arranged so as to cause minimal discomfort A mouth wash containing boric acid or thymol should be used for the sake of cleanliness Extensive false membrane may involve the buccal or faucial mucosa and is usually due to infection with Vincent s organisms A short course of penicillin by injection is effective in anginose types Sulphonamides and arsphenamine should not be used because of the abnormal hæmopoietic state Jaundice is frequent in some outbreaks and requires treatment as described elsewhere Slow convalescence is desirable

Prophylaxis

Isolation until apyrexial destruction of oronasal discharges *Glandular fever is of low infectivity and contacts* are not quarantined

Varicella Chicken Pox

Isolation and general management as for other infectious fevers Diet should be light and include bland fluids An alkaline diaphoretic mixture is beneficial Children are prone *to scratch the papules and vesicles and this may induce sepsis* and subsequent scarring The finger nails should be clipped and the arms restrained or the sleeves of the nightwear sewn up A soothing lotion such as Oily Calamine Lotion B P C with 0 25 per cent phenol may be applied to the rash Scalp lesions are very liable to contamination by secondary invaders If they are numerous the hair should be shortened *and the vesicles painted with 1 per cent aqueous gentian* violet or cetrimide solution The scabs must be allowed to mature and separate naturally but a warm bath containing chloroxylenol (Dettol) will encourage the latter process

Cases showing extensive hæmorrhagic or septic rash should have a course of systemic penicillin

Prophylaxis

Chicken pox is a highly infectious disease isolation should be enforced until the primary crusts have separated and the

underlying ulcers are healed Disinfection of clothing bed linen and tableware Susceptible contacts should be excluded from school for twenty six days from exposure The identity of chicken pox and herpes zoster viruses should be remembered and susceptible children not exposed to the latter Gamma globulin (2 5 ml into a muscle) has been used with some success

Variola Smallpox

Patients and suspects should be removed to separate wards of a self-contained isolation hospital without delay Single bed wards are desirable and free ventilation is of utmost importance

The disease is often a prolonged and exhausting one and everything possible should be done to sustain the patient s strength Treatment is otherwise directed to minimising skin sepsis and toxæmia which are most disquieting features of severe cases Diet should be liberal and consist mainly of liquids and semisolids during the *pyrexial stage* *Persistent* vomiting may be troublesome and calls for temporary cessation of feeding and one or two intramuscular doses of chlorpromazine (Largactil M & B) 25 50 mg Fluid intake must be maintained and in ravenous glucose saline is often necessary

Where the rash is profuse irritation may be allayed by application of 0 25 per cent. phenol paint in many cases the skin becomes sodden and tender making the patient s state miserable and some comfort is gained by the application of compresses of cool 1 per cent. potassium permanganate Seriously ill patients with extensive skin involvement often find dressings of any kind intolerable In these circumstances the bedding becomes soaked and malodorous The best remedy is to place the sufferer between sheets of light plastic material so arranged as to drain into a receptacle at the foot of the bed The skin of the trunk and limbs is then irrigated every two hours with 1 500 potassium permanganate or 1 40 chlorinated soda solution By this method the patient may be kept clean and comfortable with a minimum of disturbance and if hydrotherapy becomes necessary for reduction of hyperpyrexia its application is simple

hyperpnœa delirium and coma The condition can be corrected by reduction of dosage and the administration of glucose and alkalis Prolonged salicylate therapy depresses *prothrombin formation* giving rise to purpuric eruptions this is an indication for dosage with vitamin K analogues

Salicylates have serious rivals in cortisone and prednisone Disappearance of pyrexia toxæmia and joint inflammation occurs in one to five days in uncomplicated cases and all seem eventually to be controlled by the corticosteroids It was thought that they might prevent or reverse cardiac damage but further experience has not been completely happy in this regard in some cases cardiac lesions developed during the course of hormone therapy In the presence of cardiac enlargement or pericardial effusion methylprednisolone (Medrone Upjohn) is preferred as causing least water retention That the action is suppressive rather than curative is evidenced by th fact that relapse (with signs of cardiac damage) may follow premature cessation of therapy It is important therefore that modified dosage be continued throughout the natural period of the disease which is six to twelve weeks No immunity is provided against fresh rheumatic attacks Dosage cortisone 200 mg on the first day and 100 mg daily thereafter in three to four divided doses prednisolone in one fifth or methylprednisolone in one sixth of this dosage

The painful joints may be wrapped in warm cotton wool and lightly bandaged but moist heat in the form of alkaline fomentations or kaolin poultices is preferred by some Local rest and freedom from pressure are secured by the use of bed cage and pillows Hyperpyrexia is usually a sign of severe cardiac involvement and should be treated by tepid packs or sponging in addition to systemic therapy

When the acute pyrexial phase has passed a definite scheme for convalescence and rehabilitation must be formulated It is sometimes difficult to keep young rheumatics in bed once symptoms have subsided but it is desirable if complications are absent to continue the bed rest for four to six weeks Such ordinary childhood occupations as can be conducted in bed will keep the patient content and in fine weather he may be moved out of doors during the day Later he may

be carried to a sofa or chair and gradually given the freedom of the room and garden

Physical exertion should be carefully graduated and its effect judged by regular observations of the sleeping pulse rate and erythrocyte sedimentation rate A rise in either indicates that further rest is desirable Incr ase in body weight is an indication of progress Needless incarceration does harm and each case must be managed in accordance with condition and progress In particular careful watch must be kept for evidence of cardiac damage

All possible aids to convalescence and prevention of relapse should be invoked Liberal protein rich diet change of air and tonics are helpful Hypochromic anæmia is a common finding and should be met by iron medication Sensible precautions against upper respiratory infections are enjoined Exposure to damp and cold and the wearing of wet clothing are to be avoided Sulphonamides and penicillin have no influence on the course of rheumatic fever but are useful for prevention and treatment of β hæmolytic streptococcal throat infections which are productive of further rheumatic activity Phenoxymethylpenicillin (Penicillin V) by mouth offers a convenient and effective prophylaxis Dosage of 125 mg twice daily may be given almost continuously over a period of five years or until leaving school whichever is the longer (Royal College of Physicians Rheumatic Fever Committee 1957) Monthly intramuscular injections of 600 000 units of benzathine penicillin G may be more suitable for some cases

Tonsil and adenoid surgery has a disappointingly slight effect on the course of rheumatism but obviously diseased tonsils should be removed when the rheumatic process has become quiescent A course of penicillin should be given to cover the operative period

The Public Health aspects of rheumatism are of vital importance Poor environment insanitary housing and school accommodation malnutrition and ignorance of the laity in regard to the seriousness of rheumatic ailments are root causes. Rheumatic fever is notifiable

Gonorrhœa

The chances of a favourable issue are enhanced if the patient will lead a quiet life avoiding alcohol and excessive

physical exertion during treatment Sexual intercourse should be proscribed until tests of cure are satisfactory

Treatment by sulphonamides or penicillin offers an almost certain cure in uncomplicated cases and such treatment may often be ambulant It should however be adequate otherwise there is risk of the infecting organism becoming resistant Sulpha resistance is not uncommon but recourse to penicillin therapy will retrieve the situation The disinfecting action of these drugs is so rapid that it is desirable to take swabs for bacteriological examination before treatment is begun otherwise diagnosis may remain in doubt

Sulphonamide treatment The average dosage of sulphadimidine is 4 G daily in divided four hourly doses for six to eight days Sulphamerazine is convenient on account of its slow excretion and 1 G at eight hourly intervals will suffice A reasonable fluid intake should be maintained (about 4 pints daily) If unsuccessful a second course consisting of two-thirds of the amount originally given may be ordered but penicillin would be preferable

Penicillin treatment More efficient and acts more rapidly than sulphonamides It will often clear long-standing relapsed and sulpha resistant cases and is more effective against metastatic complications A single injection of 300 000 units of procaine penicillin will clear fresh and uncomplicated cases failures are usually due to reinfection *or misdiagnosis (non specific urethritis does not respond)* Penicillin tends to mask concurrent syphilis even in the small dosage required Sulphonamides and streptomycin are free from this objection L P Sheil (1956) reports good results from 240 mg of phenoxymethylpenicillin orally thrice daily for three days but many authorities prefer the parenteral method.

Streptomycin treatment Gonorrhœal infections respond well and Chinn reported good results from a single intramuscular dose of 0 6 G

The broad spectrum antibiotics appear to be equally effective therapeutic agents in gonorrhœa Greaves reports that a single dose of 750 mg chloramphenicol cured 96 per cent of seventy cases and two doses of 0 5 G of oxytetracycline orally with a six hour interval between was similarly

effective in the hands of Wright and his colleagues The tetracyclines chloramphenicol and erythromycin have been found useful for resistant and relapsed cases

The patient should be kept under observation for some weeks or months after apparent cure Satisfactory tests of cure in the male include a series of negative smears of urethral secretion taken on rising normal findings on urethroscopy and passage of a urethral sound cultures of prostatic secretion after digital massage should be negative for gonococci In the female inspection of the urethra vagina cervix should show no inflammatory reaction cultures of swabs from urethra and cervix (post menstrual) should be negative for gonococci Serological reactions for syphilis should be negative Lack of complete therapeutic success suggests the presence of an undrained focus of infection and a thorough genito-urinary investigation should be undertaken with provision of suitable drainage

Local treatment This is not used as a routine and simple cleanliness is sufficient Balanitis requires rest in bed warm baths gentle irrigation of the sub-preputial sulcus with potassium permanganate (1 5000) and dressing with wipes moistened with proflavine emulsion (1 1000)

For epididymitis rest in bed is indicated and support should be provided by a testicular splint or sling An evaporating lotion will help to relieve pain and Codeine Compound Tablets B P C are useful. A full course of penicillin is desirable Seminal vesiculitis and prostatitis are improved by rest in bed and frequent hot baths Short wave diathermy is of great service and penicillin should be given If a prostatic abscess develops surgical drainage may be required Chronic prostatitis usually responds to digital massage *via* the rectum performed daily for seven to ten days Bacteriological examination of the expressed secretion should be done and penicillin given by intramuscular injection if the organism is sensitive For infections with coliform organisms sulphonamide or chloramphenicol may be tried

There is perhaps more necessity for local treatment in the female In the early stages nothing more drastic than warm sitz baths is required When discharge and local irritation have subsided low pressure vaginal douching and urethral

irrigation with 1 5 000 potassium permanganate solution *may be helpful* but these are best entrusted to a nurse For *persistent cervicitis* 1 per cent mercurochrome *solution* should be applied to the cervix vaginal fornices and urethra after preliminary douching and swabbing the vagina dry This may be repeated at intervals of two to three days Proctitis should be treated by a short course of twice daily rectal *irrigations* with 1 5 000 acriflavine and insertion of 2 *per cent silver proteinate suppositories* Bartholinitis is treated by rest in bed and penicillin injections Abscess formation is dealt with by aspiration or incision Removal of the gland by dissection may be necessary later Salpingitis calls for rest in the Fowler position warmth to the lower abdomen and sedatives as required Penicillin should be *given in full dosage*

Conjunctivitis can be avoided by teaching patients the hygiene of washing the hands When this complication arises care must be taken to avoid infecting the sound eye although this risk has diminished with the introduction of antibiotic treatment *Purulent* discharge should be removed by irrigating the conjunctiva *with warm normal saline three hourly* followed by the instillation of Penicillin Eye drops B P C Systemic penicillin or tetracycline therapy is also of value Atropine should be used to keep the pupil dilated

Arthritis calls for confinement to bed for ten to fourteen days *after inflammation has settled down* The limb should *be steadied* by the use of sandbags or a light splint and heat applied to the affected joints A seven to twelve days course of penicillin is usually curative Purulent joint effusions should be replaced by 10 000 to 20 000 units of penicillin in saline using *strict aseptic technique Septicæmia usually responds to heavy dosage* with *penicillin* (2-4 mega units daily by three hourly injection with or without streptomycin 1 G daily) Repeated blood cultures should be done to check progress and change made to tetracycline or chlor amphenicol if necessary

Prophylaxis

Ambulant isolation for the patient including separate towels clothing tableware etc Disinfection of bath and

wash basin after use burning of soiled dressings The wearing of an improvised gonorrhœa bag or in females of sanitary pads will prevent unnecessary soiling of clothing Tactful search for contacts and source Parturient women suspected of harbouring *N gonorrhœæ* should receive 200 000 units of crystalline penicillin and 300 000-600 000 units of procaine penicillin to prevent ophthalmia in the infant

Reiter s syndrome Characterised by polyarthritis urethritis skin lesions and conjunctivitis Onset may be acute the urethro-balanitis being an early symptom The discharge never contains gonococci Chronic and relapsing varieties have been described Tetracyclines gold and cortisone have all been reported suppressive

Syphilis

Prompt diagnosis is a prerequisite for successful treatment and this can often be made by dark field examination of serum expressed from chancres or from gland puncture while serological tests are still uninformative Single serological tests may be fallacious as may be a purely clinical diagnosis hence the desirability of quantitative and confirmative tests (including treponema immobilisation) Management of the case includes careful observation and treatment of regular sexual and domestic contacts

Penicillin has of late years ousted the arsenicals for routine treatment of syphilis and the combined courses formerly popular have disappeared from most clinics

Primary and secondary syphilis Penicillin is the treatment of choice All types of benzylpenicillin are effective but one or other of the following may be used according to circumstances

1 Procaine penicillin in oil with aluminium monostearate (P A M) 1 200 000 units intramuscularly daily for 10 days followed by 600 000 units twice weekly for six weeks or Bismuth Injection B P 1 ml intramuscularly weekly for ten weeks

2 Crystalline penicillin 2 mega units intramuscularly daily by three hourly divided doses for six days followed by P.A M 600 000 units twice weekly or Bismuth Injection as above

The patient should be carefully examined and serological tests done every two months for six months and then every three months for two years The C S F should be examined at one and two years Relapsed or reinfected cases should have a repeat course

For early or late infections involving vital tissues where Herxheimer or paradoxical reactions would be undesirable the above mentioned courses should be preceded by potassium iodide mixture (gr 10 20 thrice daily) and Bismuth Injection B P 0 5 ml intramuscularly weekly for four weeks Allergic manifestations (urticaria facial œdema joint swelling) may complicate penicillin therapy These respond to antihistamines Herxheimer reactions typically following therapy of infectious syphilis have as general manifestations collapse pyrexia leucocytosis local implications consist of temporary aggravation of syphilitic lesions in heart liver brain etc Immediate treatment is rest antihistamines and if severe cortisone *Dosage schedules should be reduced* Allergic reactions may be due to penicillin sensitivity and skin disturbance is the commonest A broad spectrum antibiotic (tetracycline chloramphenicol) should be substituted in dosage of 20 mg per kg body weight daily for eight days

Latent syphilis Treated by a course of ten daily injections of 600 000 units of procaine penicillin in oil with aluminium monostearate (P A M) followed by Bismuth Injection B P 1 ml intramuscularly twice weekly for ten weeks

Follow up consists of serological examinations at three monthly intervals for one year then yearly C S F examination at three months and one year Any serological relapse calls for re treatment Many old latent cases are sero resistant

Cardiovascular syphilis Cardiac failure should be corrected as far as possible before embarking on specific therapy Young and middle aged subjects with active aortic lesions should have fourteen days potassium iodide (gr 10-20 thrice daily) with four doses of 0 5 ml of Bismuth Injection B P followed by a ten days course of P A M (600 000 units daily) or crystalline penicillin 1 mega unit daily by three-hourly injections for ten days

Neurosyphilis Meningovascular manifestations appear relatively early and are usually responsive to therapy whereas

parenchymatous lesions (tabes and general paralysis) are less amenable The following routine is applicable to all types

Procaine penicillin in oil with aluminium monostearate (P A M) 600 000 units intramuscularly daily for fourteen doses Reactions of the Herxheimer type are dangerous in neurosyphilis It is doubtful whether any previous medication (iodide mercury bismuth) will reduce this risk

Serological tests are not helpful in judging progress clinical improvement is heartening but unreliable and improvement in the C S F findings is the only valuable criterion of cure C S F examinations are done before and on conclusion of treatment at three months and then annually for five years Signs of relapse are an indication for re-treatment

General paresis requires one or more penicillin courses according to laboratory findings General health and nutrition should be attended to and obesity if present, corrected Those with severe psychotic tendencies require institutional care until the effect of specific therapy can be gauged Penicillin may temporarily aggravate the mental disturbance

Tabes dorsalis Penicillin treatment as described for meningo-vascular syphilis Serological and C S F findings are not always helpful in tabes and several penicillin courses may be necessary to halt the disease process Attention to the general health and avoidance of all excess is desirable Unnecessary confinement to bed is harmful and reasonable activity beneficial. Physiotherapy in the form of massage and re-educational exercises will improve muscle tone and co-ordination and restore self-confidence The patient should empty the urinary bladder at three hourly intervals by day retention requires catheterisation with the usual precautions against sepsis Frank urinary infection should be treated by appropriate bacteriostatics Lightning pains are often most resistant to treatment Analgesics like Codeine Compound Tablets should be tried and Panadol (aceto aminophenol) Bayer is very effective in some cases Pentobarbitone sodium gr 1½ with codeine phosphate gr ½ is useful at night when pains disturb sleep Morphine is undesirable on account of addictability but pethidine or Pethilorfan Roche 50-100 mg is perhaps safer for occasional use Inhalation of amyl nitrite is useful against laryngeal crises rectal crises yield to hot enemata and morphine suppositories

(½ G) Large intake of Vitamin B concentrates will some times lessen the frequency of these painful manifestations

Comfortable shoes and well fitted socks are desirable for prevention of perforating ulcers The feet should be kept clean and dry and amateur chiropody interdicted If an ulcer develops it should be curetted and packed with soft paraffin tulle dressing Arthropathies show scant improve ment with any therapy but effusions should be aspirated For disorganised knee joint orthopædic possibilities (including arthrodesis) should be considered

Primary optic atrophy If the pre treatment vision is 6/20 or better arrest of the process is likely Martin (1955) recom mends a mercurial inunction potassium iodide and peni cillin sequence

Congenital syphilis Early recognition and treatment are of vital importance The minimum daily penicillin dosage for children is 10 000-20 000 units per lb body weight Three hourly injections of crystalline penicillin are preferred for infants either this or P A M will serve for older children In cases of ocular involvement the assistance of an oculist should be secured as atropine and cortisone locally are often necessary

Physical examination and serological tests should be done monthly for six months and subsequently every six months for two years C S F examination on conclusion of treatment Relapse should be met by further penicillin courses

Syphilis and marriage For early infective cases marriage is interdicted for two years serological and C S F findings should be consistently negative by this time Early latent sero-fast cases who are clinically normal and who have normal C S F findings may marry but should avoid issue for two years Late latent cases may marry after satisfactory treatment Cardiac or neurological involvement should be a bar to marriage

The non infected partner must be made aware of the facts

Syphilis and pregnancy A patient who has had ample treatment and consistently satisfactory laboratory reports afterwards probably requires no further therapy but regular serological tests should be undertaken to detect reactivation Present day therapeutic routines are so safe that there is much

to be said for treatment of all pregnant women who have been infected For cases previously satisfactorily cared for ten injections each of 600 000 units of P A M over a period of four weeks is adequate For cases first coming to treatment during pregnancy either of the schedules described for primary syphilis should be used Clinical and serological follow up monthly until confinement C S F examination may be postponed until after confinement

Chancroid Soft Sore

Syphilis should be excluded by serological and microscopic tests Soft sore responds quickly to sulphonamides and to almost all antibiotics Chlortetracycline is particularly effective (750 mg. twelve hourly for three days) Local treatment consists of thrice-daily irrigation of the coronal sulcus with 1 : 4 000 permanganate solution and application of proflavine emulsion.

Leptospirosis Icterohæmorrhagica Weil s Disease

Diagnosis is often difficult and mild cases may be anicteric throughout The possibility of contact with rat excreta should be explored in unexplained pyrexia in farm workers veterinarians and persons whose occupation involves handling fish or meat Canicola fever caused by infection with L. canicola is transmitted by contact with urine of dogs suffering from the infection Pigs are carriers in some countries

In the icteric stage differentiation from other causes of febrile jaundice is facilitated by the fact that with the exception of septic cholangitis these are the only icteric states showing polymorph leucocytosis

Treatment is most successful in the pre icteric stage in cases allowed to progress to severe renal and hepatic damage the outlook is grave Penicillin in dosage of 2-4 mega units daily if given early appears to shorten the course of the disease although its efficacy is not uniform Reports of successful treatment by the tetracyclines have been noted Hall and his co-workers concluded that five antibiotics tested had no appreciable effect on the infection whereas Dorn k and Mackay Dick have recently reported satisfactory results from penicillin In a sporadic disease of this kind

dosage of 70-100 mg per stone body weight as a 1 per cent solution by intravenous drip or as Tolseram 8 24 G daily as 2 per cent solution in saline with 25 mg thiamine and 100 mg ascorbic acid Succinylcholine is a flexible and more rapid relaxant than curarin gallamine or mephenesin which is administered by intravenous infusion in decreasing dosage of from 2 5 to 0 2 mg per minute according to muscular tone and tolerance

Chlorpromazine (Largactil M & B) appears useful as an extender of the sedatives and relaxants employed Adriani and Kerr combined this drug with barbiturates and mephenesin The intravenous dose is 15-40 mg six to eight hourly

Respiratory embarrassment may arise in cases under the influence of barbiturates and muscle relaxants for this reason a closed-circuit oxygen inhaler and bronchoscopic drainage should be constantly available Tracheotomy (under local anæsthesia) is a life-saving measure in presence of prolonged spasm of the respiratory muscles laryngeal or bronchial obstruction by retained secretions or coma It should be done early rather than as a desperate resort

The help of a skilled anæsthetist is invaluable in the management of a case of tetanus

Surgical treatment Extensive operations such as amputation should be postponed until the general condition improves and some degree of immunity has accrued If the wound is unhealed it should not be dealt with until one hour after the injection of antiserum Necrotic tissue debris and foreign bodies should be removed Sinuses are opened up or excised and free drainage provided Traumatisation of non infected tissues is to be avoided otherwise absorption of toxin is facilitated The wound may be irrigated with antitoxin but some authorities prefer hydrogen peroxide In the case of limb lesions rest is secured by splintage

If spasm of the paravertebral musculature has been a prominent feature radiographs of the spine should be obtained before the patient is allowed up to exclude fracture

Prophylaxis

Careful sterilisation of surgical dressings ligatures and sulphonamide powder used for dusting wounds Antiseptic

treatment of wounds and abrasions soiled with road dust or earth Irregular and lacerated wounds should be excised aseptically or subjected to *debrid ment* if excision is imprac ticable Antitoxin should be given prophylactically if the risk of tetanus exists a most difficult decision as in some cases the injury is so trivial as to pass unnoticed dose 5 000 10 000 units intramuscularly and repeat after eleven days if required or before further surgical interference In subjects who have been immunised with formol toxoid a booster dose of 1 ml is probably an adequate safeguard unless the wound is of the deep penetrating type which cannot be quickly cleaned surgically In this case antitoxin should be given as well within ten years of immunisation the boost begins inside four days

Active immunisation with formol toxoid has proved of great value and its use in the community generally would be desirable It is given in 1 ml doses subcutaneously on three occasions at intervals of six weeks followed by booster doses at five yearly intervals The dose for infants is 0 5 ml Useful immunity accrues ten days after the second injection (See p 26)

Anthrax

Sclavo s serum is used in dosage of 100-200 ml intra venously daily for five days Anaphylactic reactions are common Favourable results have been reported from sulphonamide treatment but penicillin seems to be the most effective mode of therapy It should be given in liberal amounts *i e* 1 mega unit followed by 250 000 units six hourly for eight days combined with oral sulphadiazine Clarke found chlortetracycline effective in cutaneous anthrax His routine is 60 mg per kg body weight divided into four doses which are given at hourly intervals then 26 mg. per kg thrice daily for two days and the dose gradually reduced over the next four days

Surgical treatment of superficial lesions is not advised rest splintage and simple dressings are sufficient

Prophylaxis

Immunisation of susceptible animals with purified antigen of B lton and Strange Incineration or deep burial of animals

dying of anthrax Disinfection of hides wool hair and bristle before processing and the elimination of dust from work shops Care in handling bone meal and other imported feeding stuffs Notification

Actinomycosis

These infections are chronic in nature and variable in response to treatment with tendency to relapse The following remedies should be tried alternately or in combination and for relatively prolonged periods

Iodides A traditional remedy by reason of their reputed absorptive action on granulomatous tissue Dosage should be about gr 60-90 thrice daily for three to four weeks

Sulphonamides Sulphadiazine in dosage of 1 G four hourly for four weeks is a useful adjuvant to antibiotics

Penicillin Some pathogenic strains of Actinomyces are sensitive to this drug and dosage of 2-4 mega units daily over one to two months is often effective

Streptomycin Helpful in some cases but dosage must be liberal (2 G sulphate intramuscularly daily for one month followed by 1 G daily in the second and perhaps third months) In intestinal infections it is customary to give half the daily dose by mouth

Oxytetracycline Has proved more consistently successful than the other broad spectrum antibiotics Give 500 mg orally six hourly over two to six weeks

Isoniazid has been found useful as an adjuvant

Surgical treatment. Purulent pleural and peritoneal exudates should be drained and abscesses incised O seous infections require more radical measures once effective chemotherapy has been established Pulmonary intestinal and renal lesions without fistulation may sometimes be removed completely which results in rapid general improvement

Radiotherapy Sometimes of value in conjunction with other lines of treatment

Infective Hepatitis

This is the commonest cause of jaundice During epidemics many anicteric and sub-clinical cases arise It is

probably due to virus infection and has been transmitted experimentally by serum fæces and urine of infected persons Outbreaks are prone to occur in schools and are a cause of substantial man power wastage among troops on active service

Treatment is largely symptomatic Rest in bed should be insisted upon until the temperature is normal and the skin free from jaundice Nausea and vomiting interfere with appetite and skimmed milk and bland fluids are sufficient for the first few days As soon as the fever jaundice and anorexia abate diet should be increased especially with regard to carbohydrate and protein content a moderate allowance of fat is harmless once appetite has returned A liberal fluid intake must be maintained throughout the illness if poorly tolerated by mouth intravenous glucose (5 10 per cent) infusions should be resorted to Aperients are used sparingly as their injudicious consumption probably increases hepatic damage

Cortisone and allied corticosteroids are of some value in cases of infective hepatitis which are slow to clear

Convalescent patients should not be allowed to resume ordinary diet and activities until the liver has returned to its normal size and they are advised to abstain from alcohol for two years They are permanently unacceptable as blood donors

Homologous serum jaundice An unpleasant side effect of blood serum or plasma injections Syringe jaundice may complicate the administration of arsenicals gold etc or the taking of blood specimens by venepuncture In the case of serum jaundice the blood convalescent serum or pooled plasma has become infected with the icterogenic agent in syringe jaundice the syringe or needle has been contaminated and adequate sterilisation of these between cases will prevent the disease Infective hepatitis and serum hepatitis viruses do not induce reciprocal immunity and are presumed to be distinct The former is infective on inoculation and ingestion and is present in the blood fæces and urine whereas the latter is transmissible by inoculation and is found in the blood Gamma globulin gives doubtful protection against serum hepatitis (which does not give rise to epidemics)

Prophylaxis

Gamma globulin one intramuscular injection of 0 3 ml per kg body weight Strict cleanliness in the handling of food in kitchens and dining halls Crockery and cutlery should be washed in hot detergent solution then rinsed in hot 0 1 per cent bleaching powder solution which is allowed to dry on Anti fly measures Careful cleansing of syringes and needles after use All glass syringes are best as they can be sterilised in the hot oven at 160 C for one hour without damage Notification

Efforts have been made (by a combination of exposure to ultra violet light and addition of β propiolactone) to rid plasma of I H virus

CHAPTER III

INTESTINAL PARASITES

Ascariasis

Infestation with *Ascaris lumbricoides* is world wide and children are particularly prone Owing to the wandering propensities of this parasite ascaris pneumonia obstructive appendicitis or hepatitis may occur

Treatment Piperazine is the most effective remedy For adults a single dose of 3 5 G of the citrate usually suffices for a child of 30-60 lb 2 2 5 G and for one of 15 30 lb 1 1 5 G Santonin is a traditional treatment for an adult gr 3 5 and for a child gr ½-2 is given with calomel at bedtime and followed by a morning saline Hexylresorcinol is used in capsule form in dosage of gr 1½ for each year of age with a maximum of gr 15 for an adult A saline aperient should be given on the evening before treatment and the patient goes to bed supperless The dose is taken on waking and followed by a saline in two hours Food may be allowed after four hours and the routine repeated in five days Oil of chenopodium is efficient against round worms but less toxic remedies are preferable

Prevention Attention to personal hygiene and avoidance of uncooked vegetables and other foodstuffs

Oxyuriasis Enterobiasis

Threadworms inhabit the large bowel from cæcum to rectum Eggs are not normally found in the fæces as the female emerges from the rectum to oviposit Ova may be found on the skin of the perineal region by use of a cellophane or better a Sellotape swab Scratching causes transference of ova to the nail beds thence to the nose and mouth.

Treatment. *Gentian violet Piperazine* Clinical trials have shown that piperazine hydrate and gentian violet produced

clearance in 90 and 70 per cent of cases respectively Piperazine hydrate (Antepar elixir B W) is used in dosage of 50-75 mg per kg body weight daily for two weekly courses with an interval of one week No toxic effects are encountered with this dosage Gentian violet is used as enteric-coated capsules in dosage of gr 1 thrice daily for ten days and repeated after an interval of one week (adult) For children the dose is gr 1/6 per year of age daily given in divided doses for eight days A second course should follow a rest of seven days Dithiazanine 'Telmid Lilly is effective in dosage of one 100 mg tablet thrice daily (under 10 years twice daily) for five days

Oxytetracycline The daily dose is 10 mg per lb body weight in three divided doses for seven days The drug probably has a direct action on the mature gravid female parasite but is expensive for treatment of whole households

Enemata Quassia and saline enemata are not effective *alone as they clear the lower bowel only After a preliminary* saline wash 6-8 oz. of quassia infusion or hexylresorcinol solution (1 2 000) is injected slowly and retained

Prophylaxis

Keep the nails short and the hands clean Beds should not be shared Bath tubs are thought to spread the infestation standing up showers are preferable Soak night clothes in ammonia solution or boil before laundering Sleeping drawers and gloves should be worn at night to prevent scratching The perineal region is smeared at night with ammoniated mercury ointment It is essential to treat other carriers in the household *e g* siblings and mother

Trichiniasis

Acquired by eating improperly cooked pork usually sausage meat which is infested with larvæ of *Trichinella spiralis* Trichiniasis occurs as a natural infestation in rats and is maintained by their habit of cannibalism Pigs are infected by eating dead rats or garbage containing infected pork This cycle must be broken in order to control an outbreak of the disease

The clinical manifestations are variable If only a few larvæ are ingested no symptoms arise Massive dosage produces an illness resembling food poisoning Later muscle pains C.N S disturbance hiccough and difficulty in breathing occur and bronchopneumonia may prove fatal Facial œdema splinter shaped hæmorrhages under the nails and eosinophilia are characteristic

Treatment There is no specific remedy In the early stage give one ounce of castor oil and follow with a saline purgative in one hour Tetrachlorethylene may be used in the early stages to get rid of as many adult worms as possible In the later stages treatment is symptomatic Corti one may prove u eful Eosinophilia slowly subsides and there is a progressive rise in antibodies after this treatment

Control of outbreaks of trichiniasis 1 Suspect trichiniasis if members of a household become suddenly ill after eating pork products and inform the Sanitary Authority

2 Collect samples of the patient s fæces and blood and of suspected pork for laboratory examination

Discourage the consumption of pork unless thoroughly cooked. Freezing at − 35 for five minutes renders it safe

3 Institute inspection of pork Carcasses of pigs found dead should be burnt

4 Adequate dispo al of garbage Compulsory cooking of swill fed to pigs

5 Introduce an efficient anti rat campaign (See p 358)

Tæniasis

The tapeworm inhabits the small intestine Occasionally the cysticercus stage occurs in man producing serious results such as cysticercosis due to *Tænia solium* and echinococcal cysts due to *Tænia echinococcus*

Drugs used in treatment Male fern Mepacrine Dichlorophen

Extract of Male Fern B P (aspidium oleoresin) Administered in mucilaginous suspensions or in capsules in three equal doses of 15 30 minims at intervals of half an hour Children are given 1 minim per year of age for three doses Castor oil should not be used in association with this drug

Mepacrine The routine is days 1 2 Sodium sulphate

60 ml. of saturated solution morning and evening Fluids only with glucose Sodium bicarbonate *2 G in water thrice* daily day 3 6 a m Mepacrine 1 G (ten tablets for adults) washed down with sodium bicarbonate 2 G in a glass of water The patient stays in bed and sips water only until the bowels move 9 a.m If no scolex visible give a soap enema 10 a m. (or when scolex passed) breakfast

Dichlorophen (Antiphen M & B) Differs from other tænifuges in exerting a direct lethal effect upon the worms which are killed and digested so that on passage the parasite is macerated and unrecognisable No purging or starvation required may be given as a single morning dose of one tablet *(0 5 G) per 16 lb (7 25 kg) body weight to maximum of* 6 G or 2 G twelve hourly for three doses (adults)

These remedies have replaced male fern

Cysticercosis Focal epilepsy and intracranial compression in Europeans returned from the tropics are sometimes caused by cerebral lodgement of the parasites Treatment is as for epilepsy Decompression and removal of accessible cysts is feasible in some cases

Hydatid cysts Principal sites are the liver and lungs but they may localise anywhere Jacksonian epilepsy may occur and should have symptomatic treatment Surgical treatment *may be attempted in suitable cases Aspiration of the cyst is* unwise as the fluid is toxic and severe anaphylactic reaction is likely to result It must be removed intact if possible if not it should be marsupialised and allowed to fill with granula tion tissue

Prevention of tapeworm disease Inspection of slaughter houses and meat to detect cysticerci Attention to personal hygiene particularly in relation to dogs in countries where the disease is found Thorough cooking of beef pork and fish

CHAPTER IV

CONDITIONS DUE TO PHYSICAL AND CHEMICAL AGENTS

Electrical Injuries

These are everyday industrial hazards and occur also in regions where heavy lightning discharges are common Local injury results from contact with a line conductor or live apparatus and varies from a superficial burn to extensive charring of the tissues according to the tension of the current The general effects are due to electrolytic and disruptive forces and to heat generated by passage of the current Death may occur instantaneously if not shock is usually profound and the victim may remain in coma for hours Painful muscular spasms and delirium often follow The nervous system is most sensitive to electrical interference and cardiac upset in the form of ventricular fibrillation may be induced Permanent residua such as paraplegia cranial nerve disturbance and mental defect are found Psychoneurosis may be the only sequel

In treatment the first essential is to remove the victim from contact with the conductor if the current cannot be quickly interrupted To avoid electrifying the rescuer a non conductor such as a walking stick or wooden pole may be used or the hands protected by dry materials such as thick gloves or a thick woollen or leather garment If breathing has ceased artificial respiration should be maintained for several hours if need be Eve s rocking method is convenient until the victim reaches hospital when oxygen by positive pressure and assisted respiration will be substituted Lumbar puncture may be done to relieve coma and stimulants such as nikethamide given for respiratory or cardiac weakness Ventricular fibrillation is treated by one or more injections of acetylcholine 1 mg into the left ventricle Burns are frequently severe and call for expert care

Effects of Heat

The human body loses heat by conduction convection radiation and evaporation When the temperature of the air rises above that of the body the first three processes stop or are even reversed If air movement is slight a blanket of moisture surrounds the body and hampers evaporation and this factor becomes more serious as humidity of the air increases Two dangerous atmospheric conditions may therefore arise (1) a dry wind of speed 40 m p h or over and temperature of 122 F Here heating by reversed con vection exceeds the heat loss by evaporation (2) a wet bulb temperature of 90 F or over Damage from direct sun is no greater than that from an equivalent air temperature but sunburn is an added danger

Three clinical patterns are described although inter mediate types are common

1 **Simple heat exhaustion** Characterised by circulatory asthenia Symptoms are weakness headache nausea giddi ness and fainting Muscular cramps may be present and urinary chlorides are reduced Treatment consists of rest in a cool room and administration of 3 6 pints of water con taining 3 6 drachms of salt and flavoured with sugar and lime or orange juice Recovery is rapid but recurrence is frequent and there is often a psychogenic element

2 **Subacute effects of heat** Has an insidious and apyrexial onset and is a most grave form of heat exhaustion There is rapid derangement of blood chemistry (dehydration reduc tion in plasma chloride and alkali reserve increase of non protein nitrogen) The first stage is heralded by apathy personality change insomnia anorexia polyuria and dry skin Oral temperature may be normal but the rectal is usually raised to 102 F Peripheral shock speedily follows If untreated hyperpyrexia meningeal irritation convulsions and coma develop Malaria diarrhœa and vomiting add their quota of aggravation

For treatment the patient is put at absolute rest in a cool shaded room having a free circulation of dry air Fluids and salt should be pushed until a satisfactory urinary and chloride output are obtained An average daily requirement is 5 6 pints of water and 1 1½ oz. salt which may be taken partly

in capsule form A fluid balance chart gives useful indication of the amounts of fluid and salt required If shock is a feature 500 ml plasma should be transfu ed at the outset If the patient is unconscious glucose and twice normal saline are given by intravenous drip until diuresis and a positive chloride balance result 4th to 3rd normal saline is then substituted. Eight to twelve pints may be required to restore fluid balance (See p 204)

In the hyperpyrexial stage the temperature must be reduced to 102 F as quickly as possible by covering the patient with a wet sheet and allowing an electric fan to play on it A fall in rectal temperature of 4-6 F indicates that treatment has been successful but vigilance should not be relaxed for at least two hours in case of relapse Fluid and salt are given according to indications and lumbar puncture is necessary for convulsions or prolonged coma Circulatory failure is met by oxygen inhalations and stimulants such as intravenous l noradrenaline Respiratory failure demands artificial or mechanically assisted respiration

Intravenous quinine should be given on reasonable suspicion of malaria.

3 *Acute heat effects* Caused by sudden failure of the heat regulating mechanism Prodromal symptoms are similar to those of subacute effects of heat but coma hyperpyrexia and circulatory weakness may suddenly present Treatment as in subacute heat effects

Heat cramps may occur alone or in association with the other manifestations of heat effects Found among the stokehold personnel of steamships and in mine workers they are due to heavy muscular exertion in a hot atmosphere and respond to routine administration of salt and fluids

Prophylaxis of heat effects Gradual acclimatisation suitable clothing cool living-quarters and arrangement of the working-day to avoid strenuous exertion during warmest periods but sleep hours should not be encroached upon.

Routine administration of salt and fluids restriction of alcohol suitable and appetising diet, recreational amenities Detection and treatment of tropical infections avoidance of anæsthetics atropine antipyretics and elective surgery

during hot periods (unless air-conditioned wards are available) Alcoholics poor sweaters and prickly heat sufferers are candidates for heat effects and should be sent to a cooler climate Persons who have suffered from severe heat effects should move to a more reasonable climate as the risk of further attack is considerable

Sunburn

Severe sunburn occurs in light skinned races and is caused *by injudicious exposure to the ultra violet moiety* of direct sunlight gradual insolation produces a healthy tan Dermal injury of this kind predisposes to other heat effects Suntan oils are liable to cause a frying effect and may interfere with sweating Vanishing cream bases containing chemicals which act as a protective screen *e g* quinine hydrochloride tannic acid glycerol para aminobenzoate may induce skin sensitivity or cross sensitivity but are otherwise unobjectionable

Erythema is relieved by soothing lotions such as calamine liniment but vesicular lesions require full surgical toilet and application of protective dressings such as soft paraffin gauze Hydrocortisone ointment or lotion is an excellent remedy for sunburn

Prickly Heat

For prevention loose fitting open weave garments should be worn and changed frequently Clothing should be conscientiously laundered and not merely dhobied Adequate fluid and salt intake is desirable Careful drying of the skin *after bathing and powdering of the axillæ and groins are im*portant O Brien regards the over use of soap and bathing as contributory causes He recommended painting the affected areas with 10 per cent alcoholic solution of salicylic acid for a few days to produce *exfoliation with subsequent use of* lanolin to prevent degreasing of the skin A few days rest in a cool room and application of a salicylic acid sulphur dusting powder are worthy of trial (salicylic acid gr *8* sublimed sulphur gr *6* boric acid gr *4* zinc oxide gr *20* purified talc to 1 oz.)

1 1 000 perchloride of mercury is a useful alternative if applied after bathing and allowed to dry on

Effects of Cold

General effects of cold arise most frequently in those who are inebriated injured or have lost their way Poor physical condition hunger and lack of sleep are important contributing factors Drowsiness and an irresistible desire for sleep appear together with an euphoric uncons quent mood Cardiac failure results from extensi e freezing of the tissues

The victim should be moved to cover as quickly as possible and the atmosphere gradually warmed Dry warm blankets hot water bottles and gentle massage (without allowing the body to cool) are useful and warm sweetened drinks may be given Stimulants such as nikethamide adrenaline and later alcohol may be administered if required Artificial respiration and l noradrenaline by intravenous drip should be tried in cases showing signs of respiratory or circulatory failure

Local effects of cold are found in the hands feet and exposed parts of the body The nose ears and cheeks having little subcutaneous fat are vulnerable Freezing may occur within a few minutes of exposure particularly in a high wind Prolonged immobility and tight garments encourage sluggi h ness of the peripheral circulation

Frost bite of the nose and ears may be unrecognis d at first by the victim. The stage of stiffness numbness and waxy pallor is followed by a reactive one In *immersion foot* the skin of the affected parts may be waxy pal but is more often dusky and cyanotic. In the stage of reaction pain hyperæmia neurovascular change and œdema are common. All stages of skin lesions from superficial ulceration to gangrene may follow

The patient should be moved to a room having a temperature of 60 -65 F The body is wrapped in warm dry blankets while the affected parts are uncovered elevated and kept dry Extensive local œdema calls for skin incision and the affected areas must be cared for with strict asepsis Antitetanic protection should be given and sepsis and pneumonia treated by antibiotics. Deep ulceration and gangrene require appropriate surgical measures

Some degree of residual neurovascular impairment is inevitable (coldness cyanosis increased perspiration)

Physiotherapy will help in mild cases but sympathectomy may eventually be necessary to improve function and lessen discomfort

Prophylactic principles include suitable diet and avoidance of over fatigue suitable protective clothing changes of dry underwear and socks inunction of the extremities and face with water free grease before exposure to cold

Chilblain (Pernio) Areas of localised congestion swelling and itching on the fingers toes and legs which tend to winter recurrence in individuals with poor peripheral circulation The overlying skin may crack, causing superficial ulceration Treatment consists of warm loose clothing of the affected parts fresh air exercise contrast baths and general ultra violet radiation Vasodilators like Ronicol (Roche) and Pernivit (B D H) are of value for severe cases sympathectomy should be considered Locally in the early stages stimulation by diluted tincture of iodine or Balsam of Peru Compound Ointment B N F is helpful for broken surfaces Ichthammol Ointment B P C encourages healing

Effects of Radioactivity

Health hazards incidental to the processing of radioactive materials are considerable Pitchblende the basic ore of uranium and its disintegration product radium are dangerous *to miners and smelters because radon is liberated* by neutron capture atmospheric elements and contaminants are converted into radioactive isotopes of which some have a *long half life (C H) while others have a short half life (N O)* The route of contamination is the respiratory tract and lung cancer develops in a high proportion of workers usually after a latent period *of fifteen to seventeen years The incid*ence of this disease has been substantially lessened by dust reduction measures particularly exhaust ventilation Refining processes carry their individual risks *for example exposure* to uranium fumes may induce a chemical nephrosis Preventive measures include reduction of dust and elaborate personal hygiene *A complete outfit of clothing is kept for* workshop use only before leaving the workers bathe and change into uncontaminated clothing Eating drinking and smoking are prohibited *in the workshop to prevent*

ingestion-contamination Dust sampling and regular medical examination (including estimation of urinary radioactive output) indicate the adequacy of control measures

Instrument dial painters formerly pointed their sable brushes with the lips thus ingesting traces of radium paint Deposition of radium phosphate in the bony compact layer occurred while the spongiosa absorbed relatively little Osteosarcoma particularly of the mandible was common until a less dangerous method of applying the paint was evolved

The radiation syndrome which complicates extensive radiotherapy and the depression of bone marrow activity which is beneficial in leukæmia and erythræmia are well recognised A new risk in the shape of heightened incidence of leukæmia has arisen amongst physicians practising radioscopy and among patients extensively irradiated for ankylosing spondylitis

The operation of an atomic pile is fraught with health hazards on account of the concentration of radioactive materials and the powerful discharge of gamma rays and neutrons The fission chamber is screened by dense metal and concrete and efficient monitoring systems are employed Great care is taken in regard to disposal of wastes The coolant if air is discharged through a sufficiently tall stack to reduce site contamination to a fraction of the safe level Cooling water and chemical wastes must be trapped and stored until natural decay of radioactivity renders them safe for disposal into streams etc Disposal of partly exhausted fissionable materials is by dumping in an isolated site until disintegrated to safe levels or at sea Manipulation of radioactive substances is rendered harmless by screens and instruments of the lazy tongs type Exhaust ventilation (with trapping of the exhaust) and periodical medical examination of personnel are essential

Knowledge of the effects of massive exposure to radioactivity rests upon data from the military bombing of Japan experimental bombing and accidental contamination The effects of tactical bombing vary according to whether the explosion occurs high in the air at ground level or under water The first produces widespread material destruction

from blast It is accompanied by a momentary brilliant light and radiant heat flash which can distort metal blister tiles and set woodwork alight far beyond the periphery of the explosion area A rapidly rising fire ball is replaced by a mushroom shaped vapour cloud which releases a shower of fission product with radioactivity of variable duration (up to one minute) There is a drift down wind and isotopes are formed by neutron capture of Na Cl and other ions Strontium 90 is a particularly dangerous fall-out hazard as it gives rise to esteogenic carcinoma Gamma rays unlike neutrons are widely disseminated

In ground burst the fission products tend to be driven into the earth and widespread radioactive contamination may persist for several years In underwater explosion the heat and light flash show much reduced intensity but underwater blast waves and radioactive contamination are serious hazards

Of the effects of atomic explosion (prior to the advent of the clean hydrogen bomb) blast and flash burning are similar to but much more intense than those produced by high explosive these are estimated to be responsible for 35 and 50 per cent respectively of casualties from outside the Ground Zero zone Radiation is an appalling danger on account of the ionising radiation which lasts for a minute or so and the release of gamma rays and neutrons Within a central area of ½ 1 mile radius death is instantaneous and due indifferently to trauma from flying debris blast burning or ionising radiation Within an outer sector of 1 2 miles radius injury depends on the amount of protection and is caused by gamma rays rather than neutrons In the peripheral sector of 2-4 miles radius flash burns and variable but sub lethal radiation effects are often found again depending on the amount of individual protection

In the acute radiation syndrome of the central zone the bulk of the damage is due to neutrons which are absorbed into the skin and subcutaneous tissues Initially shock vomiting and prostration are marked If the victim survives there is a quiet interval after which pyrexia vomiting diarrhœa or intestinal obstruction from paralytic ileus supervene Severe local injury such as œdema ecchymoses

and skin vesication or sloughing occur In milder cases from the middle zone shock and other manifestations may be delayed for two to six weeks or may be absent Later wide spread tissue destruction becomes apparent and the order of decreasing vulnerability is lymphatic tissue germinal epithelium bone marrow intestinal mucosa skin There is a rapid fall in all blood cells with anginose inflammation of the oropharynx and hæmorrhagic septicæmia as in pan hæmocytopenic states generally Temporary sterility and a high abortion rate follow mass radiation and cataract has been reported Impairment of growth of male children has been noted also increased neoplastic tendency (leukæmia skin tumours) Chromosome fracture and gene mutation may be induced with results which cannot be advantageous to the community

Treatment of atomic radiation casualties must be a problem of distressing magnitude Protection is by deep shelters or by the familiar surface shelters of the last war reinforced by substantial layers of concrete or rammed earth Personal protection would be by covering the body as com pletely as possible with light coloured material Aluminium foil clothing has been suggested for rescue workers and monitoring would be necessary to decide safe working spells Decontamination units would be similar to those arranged for poison gas but radioactivity cannot be diminished by chemical treatment and only washing is useful Food stores and water supplies would need careful scrutiny Tinned foods are reasonably protected wrapped solids would be safe if the outer layer were removed but foods of porous consist ency like bread are unusable Deep well water is usually safe

In view of the large number of casualties likely to occur therapeutic resources inadequate at best must be concen trated on those who have a chance of recovery Prominence of fever intestinal irritation and epilation are of grave portent. Treatment of the acute stage is primarily that of shock panhæmocytopenia enteritis burns and sepsis It includes complete rest warmth blood and plasma replace ment together with fluids and electrolytes as required, antibiotics cortisone and appropriate surgical treatment (See G D Kersley *Brit med J* 1958 II p 379)

Alcoholism

Acute alcoholism An *emetic should be given (sodium* chloride or bicarbonate 1 oz. to 1 pint of warm water) The sufferer is then encouraged to take plenty of bland fluid If *comatose the stomach should be washed out* using 3 or 4 pints of warm sodium bicarbonate solution (2 drachms to the pint) and 10 oz. of strong black coffee may be left in He should be put to bed kept warm and a free airway main tained Always examine for injury (especially cerebral) and disease Stimulants such as caffeine sodium benzoate or nikethamide should be available and artificial respiration may be necessary Cyanosis is met by oxygen inhalation An intravenous injection of vitamin B_6 (pyridoxine) 50-100 *mg* is reputed to exert a prompt sobering effect An early morning saline a breakfast of toast coffee and fruit juice *followed by a dose of soluble aspirin will do much to restore* well being Chlorpromazine (Largactil M & B) 25 mg. three or four times daily is a useful calmative

Chronic alcoholism The aims of treatment are to provide mental and physical rest to ensure adequate nourishment and to rebuild some measure of psychological stability

Residence for several months in a home or institution is desirable as the ministrations of misguided relatives are likely to conflict with the practitioner s therapeutic intentions Willingness to undergo the prolonged course of treatment requisite for thorough cure is a hopeful prognostic portent

One to two ounces of saturated magnesium sulphate solution is a useful preliminary A high caloric dietary should be ordered and liberal fluid intake encouraged Moral sua sion is usually necessary at first as nourishment is ordinarily an insignificant item in the alcoholic s routine Some degree of hypovitaminosis follows the habitual neglect of food and the leaching out effect of alcoholic beverages Vitamin B concentrates should be given by vein at first (Parentrovite Vitamins Ltd one high potency ampoule daily) and later by *mouth*

Immediate and complete withdrawal of alcohol is the best tactic and is free from the risks associated with it in the lay mind *tapering off methods predicate* a degree of will power which seldom exists Exceptions may be made in the

case of elderly and enfeebled addicts and those who must be treated in their homes In such cases the allowance of alcohol is reduced by 25 per cent daily and the withdrawal period made bearable by the administration of atropine and strychnin in combination with tonics and sedatives

Amphetamine is sometimes of assistance in combating the severe depression incidental to reduction of alcoholic intake One tablet of dexamphetamine sulphate (5 mg) may be taken with breakfast and morning coffee

The conditioned aversion treatment is useful in young and robust alcoholics in that it provides a breathing space of sobriety during which effective psychotherapy may be exploited The patient is given a *helping* of his favourite beverage (spirits should be diluted with an equal amount of water) also an intramuscular injection of apomorphine gr 1/[illegible] repeated if necessary in fifteen minutes Ten per cent of patients do not vomit but this does not prejudice the cure Vomiting is followed by a period of sleep lasting about two hours Further doses of alcohol are offered at three or four hourly *intervals* and if swallowed are followed by an injection of the vomiting dose of apomorphine No food or drinks (except alcohol) are allowed at this stage of treatment washing and mouth toilet are forbidden

After two or three days alcohol becomes increasingly repulsive and despite severe thirst the patient will refrain from taking it Without the establishment of intense thirst it is impossible to measure his aversion to the proffered drink Towards the end of treatment the patient sweats profusely persistent vomiting occurs and the blood pressure falls (treatment is stopped when levels below 100 mm are reached) He is then allowed to take bland fluids eat light diet and to wash The apomorphine injections are continued in dosage of gr 1/[illegible] six hourly for twenty four hours followed by gr 1/[illegible] six hourly on the final day Daily injections of intravenous or intramuscular *Parentrovite* should be given

Tetraethylthiuramdisulphide (disulphiram Antabuse) raises the blood acetaldehyde level without affecting the metabolism of alcohol The Antabuse-alcohol reaction is due to interference with acetaldehyde oxidation and this substance exerts a depressant action on the myocardium,

manifested clinically by hypotension and bradycardia. The initial phase of treatment should be conducted in hospital One 0 5 G tablet of Antabuse is given and followed in one hour by 15 20 ml of the favoured spirit The reaction consists of flushing of the face and neck sense of constriction in the chest faintness and general unease The reaction induced by small doses of alcohol is unpleasant but not dangerous The same procedure is gone through each day with gradual increase in alcohol dose until maximal safe reaction is reached as judged by blood pressure readings The patient is then discharged with instructions to reduce the Antabuse dose to one half tablet daily after a week and to one-quarter tablet after two weeks *His conditioning by this background* of Antabuse continued over weeks or months is revived if he essays a drink this experience with psychiatric guidance may lead to cure

Contra indications to Antabuse treatment are diabetes hepatic cirrhosis nephritis epilepsy and pregnancy It is essential that the patient be free from cardiovascular disease and that he have a strong will to be cured An alcoholic break out may be fatal and the method should not be used with weak willed and compulsive drinkers psychiatrically unstable subjects are also unsuitable as they may develop manic reactions as a side effect of acetaldehyde hold up This treatment is therefore expedient in only a small minority of alcoholics Intravenous ascorbic acid ephedrine sulphate and oxygen inhalations have been used to cut short severe reactions Paraldehyde should not be given in association with disulphiram

Hydrotherapy has a valuable calming effect on sleepless and restless patients in the stage of convalescence physiotherapeutic resources such as massage exercises and diversional therapy are used to expedite physical rehabilitation

Sufficient sedative must be given to ensure sound sleep Casual or routine sedation especially with barbiturates should not be countenanced on account of the addiction risk Frequent change of hypnotic is desirable and the identity of the drugs used should not be disclosed to the patient The following do not tax the already damaged liver and are therefore suitable

Paraldehyde 2-4 drachms twice or thrice daily Where gradual withdrawal is being used this drug if added to the spirit allowance will by virtue of its unpleasant character help to establish a negative conditioned reflex

Phenobarbitone gr 1 thrice daily

Soluble barbitone gr 10-15 in the evening will produce sound sleep

Bromide and chloral mixture (gr 15 of each) should be substituted when immediate objectives have been gained

Some derive confidence from tranquillisers *e g* promazine hydrochloride Sparine Wyeth meprobamate Equanil Wyeth The former is given in oral dosage of 50-150 mg four hourly during the withdrawal stage and later in one half this dosage for relief of depression irritability and nausea

A complete physical and psychiatric evaluation of the patient is necessary Septic foci and painful conditions must be dealt with His mode of life should be reviewed and the importance of ample relaxation and fresh air exercise emphasised Mental conflict arising out of unharmonious domestic social or business environment should be discussed and the possibilities of solution or rationalisation canvassed The futility of alcohol as an escape should be indoctrinated

Alcoholics Anonymous A body of ex addicts who have obtained insight into the malady and realise that no alcoholic is ever cured but that a determination not to take the first drink is a sound practical philosophy By banding themselves together their experience and help are freely available to less fortunate brethren they in turn must derive considerable moral reinforcement from their praiseworthy rôle of bell wethers of the flock.

Delirium tremens This is a toxic psychosis requiring prompt isolation and treatment without the former supervision is impossible The existence of an acute infection such as pneumonia should not be overlooked Complete rest in bed is essential and the services of experienced and sympathetic attendants are invaluable Restraint is harmful, and unnecessary if effective sedation is arranged for An aperient should be administered and a semi solid diet of high caloric value pushed Alcohol is withdrawn morphine avoided but sedation maintained by paraldehyde phenobarbitone or

bromide and chloral mixture Circulatory weakness calls for stimulants such as caffeine or pholedrine

Sedation must be maintained for several days to permit resolution of the psychosis and after treatment is that of chronic alcoholism Liberal vitamin B and glucose dosage by vein is most important Some alcoholics respond well to calmatives like chlorpromazine and meprobamate

Dipsomania. A form of recurrent compulsive psychosis which is resistant to treatment Psychotherapy may be tried during the quiescent phases

Morphine Poisoning

Acute Emetics are unreliable so give activated charcoal or universal antidote six teaspoonfuls in water then wash out the stomach with potassium permanganate 1 1 000 A good airway must be maintained by endotracheal tube if necessary also oxygen and mechanically assisted respiration if required Shock is combated by intravenous saline and noradrenaline milder degrees respond to methylamphet amine hydrochloride 10-15 mg by vein Nalorphine (Lethidrone B W) counteracts the respiratory depression so fatal in morphine poisoning Dose 5 mg intravenously if respiration does not deepen within a few minutes give 10 mg followed by 15 mg at twenty minute intervals until the patient is awake and breathing normally

Morphine addiction The general management is similar to that detailed for alcoholism and it is important to relieve conditions causing pain or discomfort

Sudden withdrawal of morphine entails intense mental suffering and perhaps collapse The consumption of the drug should be reduced by 25 per cent daily and during the tapering off period some other hypnotic is given liberally The most serviceable substitutes are phenobarbitone gr 1 thrice daily paraldehyde 3-4 drachms twice daily sodium pentobarbitone gr 1½-3 thrice daily These drugs are also capable of arousing addiction and in course of a few days they should be relegated in favour of a milder hypnotic such as carbromal or bromide and chloral mixture Reserpine (Serpasil Ciba) aids withdrawal 2 mg doses being given initially

Rectal and colonic irritability is a troublesome and exhausting complication of withdrawal treatment and the best corrective is a daily saline enema and small doses of tincture of belladonna by mouth

Barbiturate Poisoning

May occur accidentally during anæsthesia and being in wide circulation these drugs are popular with would be suicides The gaily-coloured proprietary capsules while useful for identification purposes are unfortunately attractive to children

Gastric lavage is good first aid treatment within three hours of swallowing the poison The prognosis and method of treatment depend to some extent on whether the barbiturate belongs to the short action or prolonged action group With the former (pentobarbitone cyclobarbitone isomethyl barbituric acid) unless dosage is large or liver disease present the risk to life is from respiratory depression In the latter case (phenobarbitone allobarbitone barbitone) the cause of death is usually aspiration pneumonia particularly if renal impairment is present

Mild case of intoxication with short action drugs may be conscious or rousable on admission to hospital for these gastric lavage with two pints of tap water or normal saline is done and the patient allowed to sleep it off After heavy dosage with short action or overdosage with prolonged action drugs the patient will show signs of severe intoxication ii incoherence rousable only with painful stimuli coma Treatment consists of warmth (not over heating) maintenance of a clear airway by endotracheal tube aspiration of pharyngeal secretions and elevation of the foot of the bed Oxygen should be given by B L.B mask (8 litres per minute) also penicillin (500 000 units six hourly) to ward off pulmonary infection If hæmoconcentration and circulatory collapse are imminent 2 3 litres of 5 per cent glucose saline is given by intravenous drip with noradrenaline added as required Constant observation and expert nursing are essential (frequent change of posture care of mouth and pressure points catheterisation)

The place of analeptic drugs in barbiturate poisoning is

much disputed. Overdosage is difficult to avoid and often dangerous Many prefer the conservative routine outlined above with the addition of vitamins to the intravenous fluid as in Gould s treatment (see below) Leptazol nikethamide and picrotoxin have passed out of general use amphetamine sulphate is relatively safe (10-25 mg intravenously initially and repeated hourly) Caffeine sodium benzoate is harmless and may be given intravenously (0 5 G half hourly for three doses) Bemegride (Megimide Nicholas) is the least obnoxious and most reliable analeptic and 10 ml of the solution may be injected into the delivery tube of the drip set every three to five minutes until a safe state is reached (response to stimuli pupillary corneal and pharyngeal reflexes present) from which the patient will wake in up to 8 hours although he may relapse and require further dosage Average total requirement of bemegride is 200 ml Toxic signs (retching twitching of the finger muscles) call for interruption of therapy

Gould s routine for delirium psychosis and coma due to narcotics (including alcoholism and delirium tremens) is intravenous infusion of the following aneurine hydrochloride 1 G nicotinamide 200 mg pyridoxine 200 mg ascorbic acid 1 5 G 10 per cent glucose solution 100 ml and distilled water or normal saline to 250 300 ml The initial infusion should occupy forty five to seventy minutes and may be repeated once if necessary then two further injections of half the above amounts are given at intervals of four to eight hours according to progress

Lead Poisoning

Acute Wash out the stomach thoroughly with 1 per cent sodium sulphate solution leaving 2 oz in the stomach Demulcents are useful also calcium gluconate 5 10 ml of 10 per cent solution by vein for colic Morphine may be necessary

Chronic The patient should be removed from contact with the metal Colic and cramps are rapidly relieved by intra venous injection of 10 ml of 10 per cent calcium gluconate solution and the administration of aperients Chelating agents are effective in plumbism Soluble non ionic chelates

are formed only with polyvalent metallic ions They exchange these for less toxic ions in the organic complex thus causing their functional removal from the body fluids With calcium disodium versenate (E.D T A) lead displaces the calcium component. This lead chelate is water-soluble non ionisable and non toxic Dose 0 5 G per 30 lb body weight hourly added to an intravenous drip with a daily maximum of 1 G /30 lb and a weekly limit of 5 G /30 lb Ten-day courses with weekly intervals are usual Overdosage with sodium calciumedetate may cause reversible nephrosis Disappointing in organic lead compound intoxication its use has been suggested in hæmochromatosis Kinnier Wilson's disease and as an *in vitro* anticoagulant It has been used to sequester plutonium accidentally absorbed also corneal calcium deposits and as a local application to chrome ulcers

Prophylaxis

Routine physical examination (including blood-count) of lead workers on entrance and at regular intervals The use of protective garments and respirators Washing of hands before eating meals should be taken in a canteen and not in workshops Wet grinding of lead pigments Efficient local exhaust ventilation of workshops Dilute sulphuric acid ½ 1 drachm daily in lemonade Avoidance of lead piping for plumbo-solvent water supplies and for beer pumps

Arsenical Poisoning

Copious gastric lavage using 2 per cent. sodium bicarbonate in 1 per cent. sodium thiosulphate followed by demulcents such as egg white B A L is of considerable value in arsenical poisoning (2-4 ml of 5 per cent oily solution intramuscularly four hourly for the first day twice on second and third days and daily thereafter for ten days)

Carbon Monoxide Poisoning

The patient must be moved out of the contaminated atmosphere immediately and the receiving room should have a free circulation of fresh air Continuous oxygen inhalation by tent or B L B mask should be arranged and

artificial respiration by Eve s method or mechanical res pirator given if required The patient must be kept warm and with a clear airway and stimulants *e g* nikethamide injected if sign of circulatory failure appear Blood transfusion and intravenous procaine have also been found of value

In view of the firm nature of the carboxyhæmoglobin affinity complete rest and oxygen inhalation are often necessary for many hours after apparent recovery and supervision should continue for several weeks P ogress may be gauged by spectroscopic examination of the blood

CHAPTER V

VITAMIN DEFICIENCIES

Vitamin A

Axerophthol or vitamin A proper is one of a group of substances having similar action and the principal provitamin is carotene The vitamin has been synthesised by Isler and others The main function of this group is to promote the integrity of epithelial structures Lack causes deficiency of dark adaptation owing to defective synthesis of visual purple and visual violet and night blindness follows Even after prolonged deprivation defective dark adaptation occurs in a few subjects only and no other condition attributable to the deficiency has been discovered Other manifestations of experimental deficiency in animals are xerosis of the cornea and conjunctiva papular skin rashes and keratinisation of various epithelial surfaces which facilitates infection Thus squamous metaplasia of pulmonary epithelium leads to inflammatory change and in the case of the renal pelves encourages formation of calculi This vitamin is necessary for growth of bone overdosage leads to abnormal *periosteal bone deposition*

Deficiency occurs in starvation states and in fat free diets defective absorption is found in sprue and cœliac disease The carotene vitamin A conversion takes place in the bowel and the vitamin is stored in the liver disease of the latter organ will induce devitaminosis.

Rich sources of vitamin A are fish liver oils and the flesh of oily fish Butter is a relatively good source (60 i u per G) and human milk during the early part of lactation Carotene occurs in green vegetables (9 i u per G) and carrots (19 i u per G) Mixtures of vitamin and provitamin are found in tomatoes peaches and apricots

The average daily requirement for a child is 4 000 i u and 3 000 i u for an adult, but this figure must be doubled during

B P C for curative treatment do‿ble this dose is sufficient Overdosage may cause kernicterus

Vitamin K is a useful addition to the pre and post operative management of jaundiced and hepatotic subjects *Injections of 5 10 mg of menaphthone are ordered several time daily for three days before and following operation* afterwards continuing with oral dosage Menaphthone has been used prophylactically in sprue and cœlic syndromes Phytomenad one vitamin K_1 (Konakion Roche) controls bleeding cause by coumarin and phenindione overdosage Dose 10 mg. intramuscularly or 1 2 10 mg capsules orally These drugs have no value in hæmorrhagic states other than *those resulting from hypoprothrombinæmia They have been* reported useful in some cases of urticaria and chilblains and during salicylate therapy

Vitamin B

Members of the B complex are found in many foodstuffs At least thirteen factors have been identified but their significance in the human economy has not yet been defined

Vitamin B_1 (aneurine hydrochloride thiamine) Antineuritic or beri beri factor Occurs in yeast wheat germ liver kidneys lean pork peas and beans It appears to function as a co-enzyme in the pyruvic s‿ge of carbohydrate meta bolism and increased blood pyruvate affords a convenient test for devitaminosis Vitamin B_1 *is essential for nutrition of nerve cells probably by promoting glucolysis within the* nervous tis ues The features of B_1 deficiency are anorexia vomiting (which aggravates the deficiency) constipation weight loss increased fatigability dyspnœa œdema tachy cardia and cardiac enlargement loss of Achilles reflexes and vibration sense wrist and foot drop and tenderness of the calf muscles

Beri beri is associated with deficiency of this vitamin but other considerations such as the proportion of carbohydrate in the dietary are of importance This disease does not develop under conditions of complete starvation but appears if excessive carbohydrate is given without adequate vitamin B_1 particularly in circumstances of strenuous physical exertion

Beri beri is endemic in Eastern countries amongst populations whose staple diet is cereal Bleaching or milling denudes the cereal of bran and endosperm which contain the vitamin and al oholic extract of rice polishings has long been recognised as curative High-extraction flour although unpalatable to many and unpopular with bakers conserves this vitamin to the community which otherwise is diverted to animal feeding. The full blown syndrome of polyneuritis (dry beri beri) myocardial weakness and œdema (wet beri beri) gastro-intestinal or mental upset (Wernicke s encephalopathy) is rarely encountered in this country but polyneuritis and acute cardiac failure may be found in elderly persons suffering from chronic undernutrition in diabetics and alcoholics (particularly those engaged in heavy manual occupations) Conditioned deficiency may occur also in colitis sprue and intestinal obstruction where absorption of the vitamin is defective Synthesis in the bowel is inhibited by bacteriostatic drugs

The normal daily adult requirement is about 1 2 mg. (330-660 i u) Larger amounts are necessary in childhood pregnancy lactation diabetes hyperthyroidism and in strenuous physical exertion

Sources (i u per G)

Wheat germ	9 5	Yeast	4 6-8
Bacon	4	Oats	1 8
Egg yolk	0 5	Wholemeal	0·9 1 7

Aneurine Hydrochloride Tablets B P 3 25 mg
Injection of Aneurine Hydrochloride B P 25 mg. per ml
Curative dose 20-100 mg daily

Acute beri beri requires rest in bed a light diet containing liberal amounts of first-class protein (milk, cheese eggs soups etc) and venesection if the right heart is labouring. Intravenous dosage of aneurine (50-100 mg daily) should be given until improvement is manifest oral dosage may then be substituted For treatment of polyneuritis and myocardial failure see appropriate sections.

Vitamin B_2 includes several factors

Pellagra prevention factor nicotinic acid. Has been

synthesised and forms part of a co-enzyme oxidative system essential for cellular metabolism The characteristic features of pellagra are glossitis stomatitis symmetrical dermatitis with increased *pigmentation of the exposed skin enteritis and* mental disturbances Mild cases showing skin and mouth lesions are not infrequent in this country but the disease is endemic in areas where maize is the staple diet The normal *requirement of nicotinic acid is about 10 mg daily It* circulates in the body as nicotinic acid amide and it is usually administered in this form on account of unpleasant flushing and tingling of the face which the acid causes The richest *natural sources are yeast wheat germ liver fish and pulses*

Pellagrins should have a liberal diet containing 100 150 G protein and alcohol is forbidden The curative dose of nicotinamide is 250-500 mg daily orally or 80 mg by vein *Moderate degrees of anæmia will respond to iron but blood* transfusion is necessary in severe cases Suitable protection from sunlight must be devised and soothing lotions prescribed for the dermatitis

Riboflavine *A co-enzyme for the activation of certain* respiratory ferments such as cytochrome It is obtained synthetically and in milk meat liver eggs fish green vegetables and fruits The normal requirement is about *2 3 mg daily Deficiency causes* cheilosis angular *stomatitis* desquamative glossitis kerato-conjunctivitis and seborrhœic dermatitis of the pinna and nose For treatment 10 20 mg daily by mouth is sufficient in most *instances but temporary resort may be necessary to the* intravenous route (5 mg thrice daily)

Vitamin B_3 (pantothenic acid) Found in all animal tissues (notably liver and kidney) *in yeast wheat and cultures of fungi* and bacteria The acid has been synthesised It is essential to many species and is an activator of the acetylation enzyme systems Experimentally it prevents achromotrichia but this *has no validity for the human species The* substance has been used in treatment of deprivation states particularly the Indian burning feet syndrome

Vitamin B_6 (pyridoxine) Present in meat liver yeast egg yolk, *peas and soya beans* and has been synthesised In animals deprivation causes dermatitis hypochromic anæmia

and neuronic degeneration In man seborrhœic dermatitis and hypochromic anæmia follow deficiency of this factor Pyridoxine has been used in drug reactions (100-200 mg daily by mouth or vein in radiation sickness and hyper emesis gravidarum (20-100 mg daily)

Folic acid (pteroylglutamic acid) Present in green leaves and all animal tissues and produced synthetically Is a growth factor for *Lactobacillus casei* Other similar substances have been identified *e g* folinic acid (citrovorum factor) to which folic acid is probably converted in the body by indirect action of ascorbic acid

The substances of this group show a hæmopoietic action but their relationship to vitamin B_{12} is still obscure They are used for correction of macrocytic anæmias associated with sprue steatorrhœa pregnancy and nutritional deficiency

Vitamin B_{12} (cyanocobalamin) Rickes and Lester Smith isolated a cobalt-containing pigment from liver extracts which is probably identical with the extrinsic factor of Castle It is produced commercially as a by product of streptomycin manufacture by deep fermentation of *Streptomyces griseus* An active hæmopoietic in Addisonian and other macrocytic anæmias

Choline A constituent of the B complex which functions biochemically as a transmethylating agent Experimental evidence suggests that it protects the liver from fatty degeneration It has been used (with doubtful effect) for prevention or reversal of post hepatitic and cirrhotic liver damage

Vitamin C

The antiscorbutic vitamin is ascorbic acid (hexuronic acid) The natural substance is found in many fruits and vegetables including black currants strawberries citrus fruits tomatoes potatoes swedes brussels sprouts and cabbage Its function is enzymic in the oxidation of aromatic amino-acids, and it is concerned with the integrity of colloid matrix structures *e g* collagen The daily requirement is about 30 mg this is increased three to five fold during pregnancy lactation and acute infections The following contain 30 mg ascorbic acid

Fresh orange juice	1½ 5 oz
Ministry of Food orange juice	½ oz
National rose hip syrup	⅓ oz
Cooked new potatoes	3 6 oz
Fresh tomato purée	*4 oz.*

Vitamin C deficiency manifests itself by increased vascular permeability leading to hæmorrhages into the skin subcutaneous and subperiosteal spaces The mechanism of capillary fragility does not depend on ascorbic deficiency alone but also on lack of flavones *e g* citrin quercitrin hesperidin Ascorbic acid is essential for maturation of erythrocytes in the bone marrow and for wound healing Deficiency causes interference with osseous development the layer of provisional bone remaining wide unorganised and readily frangible The diaphyseal shaft shows rarefaction with sub-periosteal hæmorrhages

The clinical signs of scurvy vary according to the extent and duration of the ascorbic deficiency Early signs in infants and children are loss of appetite fever sore mouth and tender limbs later anæmia becomes marked and hæmorrhages occur into the mouth skin orbit muscle layers under *the periosteum or into the epiphyses of long bones A breast* fed infant normally obtains 30 mg of vitamin C daily in the milk but minor degrees of deficiency are common in hand fed infants because cows milk is an unreliable source of this vitamin When fruit juice is unavailable or ill tolerated a daily dose of 30 mg ascorbic acid should be given from birth *Care must be taken to fortify prescribed diets with this* vitamin peptic ulcer diets in particular tend to be scorbutic

Adult scurvy is occasionally found in eccentrics and in elderly and enfeebled subjects living alone The signs are hyperkeratosis of the hair follicles ecchymoses spongy and bleeding gums with loosening of the teeth Inertia normochromic anæmia *œdema and ulceration of the legs follow* and in severe cases bleeding into the knee joints and kidneys occurs Treatment consists of revision of the diet and administration of 200 mg of ascorbic acid by vein daily for seven days similar dosage is subsequently continued by mouth

Mouth lesions require citric acid mouth wash (4 drachms of saturated solution to 8 oz water) and dental treatment when the deficiency has been corrected Liberal iron therapy is beneficial in anæmia Hæmatomata are treated by immobilising the limbs with sandbags or light splintage

CHAPTER VI

DISEASES OF THE DIGESTIVE SYSTEM

DISEASES OF THE MOUTH AND PHARYNX

Acute Stomatitis

The causes of this condition are local such as lack of dental hygiene and general such as acute leukæmia neutropenia scurvy gastric upsets metallic poisons and severe infections *e g* typhoid fever Treatment must be directed primarily to the cause Simple stomatitis responds to frequent mouth cleansing particularly after meals with mild antiseptics such as 1 per cent each of sodium perborate and sodium chloride Mandl s paint is also effective Hydrogen peroxide may be used occasionally but is irritant on prolonged application In enfeebled patients lubrication with glycerin containing a few drops of lemon juice will prevent drying of the mouth and lips

Thrush occurs most frequently in hand fed infants and is an index of unsatisfactory hygiene

Ulcerative buccal lesions respond quickly to application of 1 per cent aqueous gentian violet solution Hydrocortisone antibiotic applications have been found of value for recurrent aphthous ulcers and labial herpes

Gangrenous stomatitis is a phagedenic ulceration of the buccal surface with severe constitutional reaction It is occasionally seen in malignant exanthemata and blood dyscrasias Tube feeding is usually necessary and vitamin concentrates should be added to the feeds Peroxide mouth washes are helpful Penicillin in liberal dosage by injection is often effective but the broad spectrum antibiotics tend to cause denudation of the buccal mucosa Anæmia must be remedied by blood transfusion if necessary In neglected cases plastic surgery may be required later for correction of soft tissue defects

Vincent's Angina Manifests itself as a hypertrophic and hyperæmic condition of the gingival margins Bleeding and fœtor are common Secondary ulcers with false membrane formation occur on the palatal buccal and tonsillar mucosa Ulcerated surfaces should be painted with 1 per cent gentian violet, and potassium permanganate mouth washes (1 1 000) given Where lesions are extensive injections of procaine penicillin or oral penicillin should be given, and an adequate intake of vitamins B and C assured

To avoid relapse necessary dental treatment is carried out during a quiescent phase The patient should be instructed in dental hygiene including the cleansing of intercervical dead spaces and the principles of gum massage The patient's tableware should be marked and kept for his exclusive use

Pyorrhœa Alveolaris

Careful dental overhaul is the first necessity Devitalised and crowned teeth should be extracted and all doubtful teeth regarded with distinct prejudice Partial dentures must as a rule be sacrificed likewise fixed metal bridge work Scaling and polishing are required at regular intervals to prevent tartar concretions Chromic acid applications are advantageous in some cases The patient should be instructed in the proper use of dental points and toothbrush Digital gum massage is helpful in early cases if properly performed non pultaceous foods which require brisk chewing *e g* raw apples provide physiological massage

More advanced cases show interdental pockets and purulent discharge Penicillin applications will arrest the pyogenic process temporarily but while the pockets remain re infection is inevitable Gingivectomy gives excellent results in suitable cases by abolishing the pockets Dental clearance is the only remedy in severe and long standing cases

Pharyngitis

Acute Frequently due to irritation, *e g* tobacco or exposure to cold or damp When it occurs as part of a common cold or tonsillitis the patient should remain in bed until the infection has subsided An alkaline mixture should be ordered with gargles of dilute Compound Glycerin of

Thymol B P C or aspirin For relief of irritating cough Codeine Linctus B P C and spraying with 0 5 per cent ephedrine sulphate in normal saline are useful

Chronic. Irritants such as tobacco and alcohol should be avoided and dental tonsillar or nasal sinus infection eradicated Nasal obstruction must be relieved General tonic measures and local astringents are indicated

DISEASES OF THE ŒSOPHAGUS

Acute Œsophagitis

May be caused by *swallowing irritant or hot fluids* impaction of a foreign body or by over long retention of a gastric tube Treatment is directed to the cause Feeding can offer a difficult problem and resort to intravenous infusion of glucose amino-acids and salt solutions may be imperative Rupture of the damaged œsophageal wall with infection of the mediastinum is a grave complication, sometimes remediable by emergency surgery and energetic antibiotic therapy

Œsophageal Stricture

Fibrous stricture may be a sequel to chemical, traumatic or peptic ulceration or to gummatous infiltration Lesser grades are relieved by œsophagoscopy and dilation under direct vision repeated at intervals as necessary Gastrostomy with retrograde dilation of the stricture may be required for those involving the lower end of the œsophagus Excision of the stricture will give relief in suitable cases

In infants congenital stricture may be due either to the presence of a segment of imperfectly developed œsophagus or to a short œsophagus with the gastric cardia situated in the thorax The differentiation is a radiological one Treatment is by repeated *bouginage* Congenital œsophageal atresia is fatal unless promptly recognised and treated by plastic repair

Œsophageal Carcinoma

Careful dietetic supervision is necessary in the later stages nourishing liquid foods such as milk, soups and custards are indicated When mouth feeding becomes impossible on

account of obstruction some relief may be given by insertion of a Souttar s tube Gastrostomy prolongs life and increases comfort and it should not be unduly delayed Radical surgery of œsophageal neoplasm has become a feasible routine Radiotherapy has some palliative value in other cases

Œsophageal Peptic Ulcer and Hiatus Hernia

Caused by ulceration of *ectopic* gastric mucosa situated just above the cardiac sphincter It may follow prolonged vomiting, either post-operative from intestinal obstruction or in pregnancy Hiatus hernia is a constant finding For treatment the patient should be nursed as far as possible in the sitting up position and a peptic ulcer routine instituted Solid food is withheld for some weeks until disappearance of the characteristic lower sternal pain. Obesity must be corrected Gross or long continued bleeding causes anæmia, which should be treated by intramuscular iron Afterwards the patient must acquire the habit of thorough mastication and each meal should conclude with a dose of antacid and a few mouthfu' of water to free the œsophagus of gastric acid

Scarring may give rise to stricture which requires dilatation under direct vision or if sev re resection. Large hiatus herniæ and those causing persistent symptoms should be treated surgically

Plummer Vinson Syndrome

This condition occurs in debilitated females of middle age Gastric achylia and atrophy of the buccal and pharyngeal mucosa are always present and often a microcytic anæmia. The complaint is of difficulty in moving food masses from the hypopharynx into the œsophagus

All measures calculated to improve the patient s nutrition should be employed. A liberal semi solid dietary with reinforcements of eggs beef tea and casein digests will encourage gain in weight Anæmia should be combated by intensive iron therapy (See p 173) Dilatation of the upper portion of the œsophagus by bougies is done by œsophagoscopy and repeated as necessary The dysphagia may be aggravated by a mucosal web or shelf in the hypopharynx

which should be divided Some of these patients develop post-cricoid carcinoma

Achalasia of the Cardia Cardiospasm

This condition should be recognised early otherwise extensive dilatation of the œsophagus will take place Temporary relief of mild cardiospasm follows the inhalation of octyl nitrite or the subcutaneous injection of atropine sulphate gr $\frac{1}{100}$ five to ten minutes before meals

Negus s hydrostatic dilator is usually effective in early cases In long standing cases where ulceration of the œsophagus complicates the picture the use of dilators is not without risk here gastrostomy with dilation of the cardia or a cardioplasty operation is to be preferred

Œsophageal Diverticulæ *If situated in the upper œsophagus* should be excised but those in the thoracic œsophagus only if giving rise to symptoms

DISEASES OF THE STOMACH

Acute Gastritis

If due to a known irritant this should be removed by repeated washing out of the stomach through a soft stomach tube using in all about two gallons of warm water containing the appropriate antidote Finally a demulcent such as egg white starch or gruel may be left in the stomach Shock and collapse must be treated by elevation of the foot of the bed and stimulants *e g* caffeine sodium benzoate nikethamide blood *or plasma transfusion l noradrenaline by vein* Jejunostomy may be necessary to save life

Acute gastritis may result from the ingestion of unwholesome or unsuitable food Nausea and vomiting are usually prominent The patient should be kept in bed and the diet reduced to frequent small doses of bland fluids such as barley or albumin water and diluted fruit juice When the symptoms have abated gradual restitution of diet may be permitted A gastric sedative such as *Aluminium Hydroxide* Mixture B N F is useful in the early stages

Chronic Gastritis and Dyspepsia

Systematic survey of the patient s state and environment is an essential preliminary Faulty dietetic habits poor working conditions and excess of tobacco or alcohol must be remedied before success in treatment can be looked for Physical examination should be made to exclude the presence of morbid conditions such as cardiovascular or renal disease or anæmia Attention should then be focused on the abdominal viscera as gastric symptoms may be the only manifestation of abnormalities of the bile tract appendix or intestine Pyorrhœa dental inadequacy and morbid nasopharyngeal states have an adverse influence on gastric function Finally the digestive processes should be investigated by fractional test meal and opaque meal examination and gastroscopy will often yield valuable information By adoption of a routine for investigation much useless treatment and needless suffering can be avoided

The patient s mode of life should be recast on sound hygienic lines A holiday from business worry or from exacting relatives will often terminate a dyspeptic habit. Rest and suitable outdoor recreation are important and regular meal hours are to be observed Diet should be liberal and easily digested Meals should be compact eaten dry and thoroughly masticated Fluids are best taken between meals

The patient s dietetic preferences should be respected so long as they are compatible with fundamentals of treatment and finicking routines avoided Milk eggs chicken white fish veal lamb and tender meat are good if simply cooked Frying and greasy methods of cooking make for indigestibility Starch and sugar are allowed in moderation provided that flatulence is not a prominent symptom Fats are given only in strict moderation Indigestible foods such as game cheese and butcher s offals are best omitted Potatoes and root vegetables often disagree but purées of green vegetables may be allowed if liked Raw salads and fruits may cause discomfort but tomato juice or pulp citrus and pineapple juice may be given if well tolerated Alcohol spices pickles and condiments may be harmful in some cases although a pre prandial aperitif is helpful in atonic dyspeptics

Medicines are of secondary importance to dietetic management For indigestion with hyperchlorhydria, an antacid powder or mixture should be given in the early stages Achlorhydric dyspepsia is rarely improved by administration of mineral acid paradoxically alkalis are usually more effective

Regular bowel action is encouraged by minimal doses of liquid paraffin but purging is harmful

Dyspepsia of nervous origin should be explained to the sufferer as such practical psychiatric measures including calmatives are indicated the digestion receiving only incidental attention

Gastric and Duodenal Ulcer

Systematic and prolonged medical treatment should be tried in every case of peptic ulcer The patient s co-operation is enlisted by explaining something of the natural history of the disease and the rationale of the therapeutic measures

Preliminary attention to the teeth nose and throat is desirable and any other morbid condition such as appendicular disease should have appropriate treatment

The traditional peptic ulcer routine occupies six weeks (more or less according to severity of the condition and progress) the patient remaining in bed for the first two or three weeks In the absence of complications he may rise daily for a warm bath and for evacuation of the bowels Smoking and alcohol are forbidden His mind should be freed from business and domestic cares and as a rule this mental quiet can be best secured in hospital or nursing home Diversional therapy in the form of reading games or any light handwork which appeals to the patient is worth while Apart from relief of pain diet and medication are of minor importance by comparison with rest and relaxation

Some authorities commence treatment of all but mild cases with a three or four days continuous intragastric milk drip using 6 pints of milk daily with Casilan Glaxo and 1 per cent. suspension of colloidal aluminium hydroxide at the rate of fifteen drops per minute Most patients prefer orthodox diet, but the use of a milk drip during the night (2 pints plus aluminium hydroxide suspension 1 oz) is advantageous in

cases with persistent nocturnal pain not relieved by complete aspiration of gastric contents

Peptic ulcer diets are arranged in conformity with the following principles

1 High caloric value with liberal protein content and rich in vitamins to improve nutrition and encourage healing of the ulcer

2 Non stimulating to the gastric mucosa.

3 Bland to avoid mechanical trauma liquid to permit of ready buffer action with gastric secretion

4 Frequent regular feeds to keep the gastric juice occupied

Lenhartz diet consists of milk and eggs with rapid augmentation by sugar minced raw beef and ham It is perhaps over generous at the beginning and raw meat is unpopular

Sippey s Hurst s and Maclean s diets These have a basis of frequent milk feeds with the administration of alkalis Other bland foods are added by stages Of late the strict mushy types of diet have attracted criticism on the grounds that they do not remain in the stomach as long as more solid meals and that ulcers may remain unhealed despite their prolonged employment The following modification of Maclean s diet gives good results and is comparatively simple in practice

First week Three pints of milk daily in two-hourly feeds between 8 a m and 10 p m. These should be given warm and sipped slowly Sodium citrate gr 10 is added to four feeds and the others may be flavoured with Farex Horlick s or Ovaltine Half a teaspoonful of Magnesium Trisilicate Compound Powder B P C is given in water after each feed.

In the odd hours 4 oz feeds of strained gruel junket, custard or potato purée are taken followed by one half teaspoonful of Magnesium Carbonate Compound Powder B P C in water

Four two-drachm doses of olive oil are given before feeds daily alternating with four doses of atropine sulphate gr $\frac{1}{100}$ (orally) A dose of trisilicate and one of atropine are given before going to sleep at night Anticholinergic drugs of the propantheline series have been used in place of atropine

for reduction of gastric acidity and relief of ulcer symptoms but a combination of atropine and phenobarbitone seems adequate for most cases One or more feeds and some trisilicate should be placed by the bedside *in case the patient* wakens through the night Active ulcers in the pyloric region may cause spasm and troublesome vomiting Procaine is a useful remedy (20-30 ml of 5 per cent solution orally)

Whatever the type of diet used hypovitaminosis must be prevented by giving three Vitamin Capsules B P C daily

Normal bowel movements are to be aimed at and the trisilicate or the magnesia intake should be reduced according to *whether constipation or diarrhœa prevails Occasional* doses of liquid paraffin emulsion may be necessary

Milk alkali syndrome Patients on prolonged ulcer therapy may develop malaise lethargy and mental confusion leading to coma Vomiting is frequent with polyuria hyper calcæmia alkalosis and evidence of renal defect Treatment is by drastic reduction of alkali base intake and sodium chloride administration by vein if necessary

Second week In the absence of symptoms the following *are added Two or three eggs daily as egg flip or lightly* boiled Fruit and milk jellies cream mashed potatoes and vegetable purees Thin bread and butter with sieved jam or marmalade Barley sugar fruit drops and Turkish delight The milk feeds are reduced in number by half and the powder reduced to six doses daily

Third week The following are added Strained porridge milk and custard puddings steamed or boiled white fish scraped or minced underdone roast beef minced chicken Sieved vegetables and fruits such as tomato cauliflower spinach apple apricot or prunes Feeds are reduced to six during the day with milk and biscuits or sponge fingers by night if awake Reduce the antacid to four doses a day and a night dose if required Combinations of milk protein or glycine with aluminium *hydroxide in tablet form (Nulacin* Prodexin) are useful for after treatment These products should be allowed to dissolve slowly in the mouth

Fourth fifth and sixth weeks Add minced beef lamb or mutton scrambled or poached eggs sieved root vegetables

mild cheese plain cakes and biscuits The atropine can usually be dispensed with at this stage

Recurrence of symptoms is an indication for temporary simplification of the diet The patient should be allowed up after the third week and gentle exercise in the fresh air is beneficial Finally the diet is consolidated into four main meals with four snacks in between and sweets and chocolate (without fruit or nuts) may be taken The oil can usually be omitted on completion of the cure and from four to six doses of powder by day and extra doses at night if awake will suffice for the average case Iron should be given if there is evidence of anæmia (intramuscularly in the early stages a liquid oral preparation e g Ferromyn Elixir Calmic is well tolerated later)

The risk of recrudescence of the ulcer must be impressed on the patient as well as the necessity for prolonged dietetic care

Period opaque meal examinations and occult blood tests are desirable to confirm clinical impressions of progress gastroscopic examination is useful in certain cases Re examinations are required in cases of gastric ulcer

Hæmatemesis. Strict rest in bed and absolute quiet are essential Morphine gr ¼ or Papaveretum Injection B P C 1 ml should be injected subcutaneously Two-ounce feeds of albumin water glucose solution or plain milk at hourly intervals may safely be allowed from the outset and one third normal saline flavoured with fruit juice given in quantities sufficient to relieve thirst If bleeding persists gentle lavage of the stomach by means of a soft rubber tube will get rid of blood clots and facilitate hæmostasis When dehydration and shock have been surmounted Witts s modification of Meulengracht s diet should be begun.

The pulse rate and blood pressure are charted hourly If the former rises above 120 or the latter falls below 100 a drip transfusion should be commenced without delay The hæmoglobin level (after eight hours) is a good guide to further treatment and if it falls to 40 per cent. a litre of blood should be transfused by slow drip If the bleeding continues several litres of blood may be required but rapid tanking up is inadvisable unless immediate operation is contemplated

After a few days freedom from hæmorrhage a full ulcer régime is instituted and iron given intramuscularly

Surgical Treatment

The question of surgical intervention arises in all cases of hæmatemesis and melæna which are not immediately *responsive to the foregoing measures Young and otherwise* healthy subjects with recent dyspeptic histories are often amenable but the middle aged patient with a chronic history may well be a candidate for surgical hæmostasis This generalisation has many exceptions however and the results of surgical intervention are now so good that there is little excuse for over long dalliance with expectant methods A *patient who needs transfusion may well require operative* treatment also Hæmorrhage complicating perforation is an indication for laparotomy

Simple hæmostatic operations have been relegated in favour of gastrectomy and gastro-duodenectomy Although associated with a higher operative mortality hæmorrhage is controlled with greater certainty and their long term results are superior

Once the decision to operate has been taken an intravenous blood-electrolyte drip should be set up to condition the patient as well as possible

Other Indications for Surgical Treatment

1 *Chronic resistant penetrating or relapsing ulcers with severe symptoms* Patients who are unwilling or unable to observe dietetic instructions The nature of the operation will depend upon the lesion and the surgeon s preference

Gastro-enterostomy An unphysiological operation which yields excellent immediate results but the after histories are disappointing Should be avoided if possible in younger subjects but is suitable for poor risk cases and for middle aged patients *(mostly women) where gastric acidity has* waned but whose symptoms are perpetuated by cicatricial pyloric stenosis

The stoma may become ineffective or ulceration may affect the stoma or efferent loop and lead to hæmorrhage or

perforation Gastro-colic fistula is an occasional troublesome sequel.

Vagotomy with pyloroplasty or gastro-enterostomy Vagal section reduces the gastric secretion particularly the psychic and nocturnal moieties Gastric peristalsis is also inhibited so that dilatation and pyloric obstruction may be precipitated unless adequate outlet is assured On account of gradual reintegration of the gastric innervation permanent results are rarely obtained Vagotomy is contraindicated in gastric ulcer but has proved of value in cases of anastomotic ulcer following subtotal gastrectomy

Gastrectomy The operation of choice for gastric ulcer and the extent depends on the location of the ulcer With duodenectomy it is at present the most popular operation for duodenal ulcer and bleeding cases withstand it remarkably well if properly conditioned by transfusions etc

Post gastrectomy *dumping* syndromes of various patterns have occurred in 5 10 per cent of cases Weakness sweating and syncope are amenable to temporary alteration of the diet to include six small meals of liberal fat content daily instead of three large ones Hypoglycæmia appears two or three hours after meals Iron deficiency anæmia and macrocytic anæmia vitamin B deficiency and pulmonary tuberculosis occasionally occur as sequels of gastrectomy

2 *Acute perforation* There is still some debate as to the best method of treatment and Taylor favours conservative measures in selected cases Simple suture has a poor record as regards ulcer recurrence and further perforation Emergency gastrectomy is practised in some centres with good results in others suture is done in the first instance with elective gastrectomy later if ulcer symptoms return or radiological evidence or activity persists

3 *Chronic perforation* Operative treatment depends upon the findings, on the patient s condition and surgical resources available

4 *Hour-glass contraction of the greater curvature* is usually treated by partial gastrectomy but sleeve resection is preferred by some surgeons.

5 *Pyloric obstruction* Leads to increasing gastric dilatation which necessitates surgical relief A preliminary course

of medical treatment is given but alkalis must be used sparingly as owing to the loss of chloride by vomiting alkalosis is easily precipitated Nightly gastric lavage for seven to ten days prior to operation will allay concomitant gastritis and improve muscular tonus Immediate pre operative care includes a careful watch on the blood chem istry and correction of the fluid-electrolyte balance by glucose salines and potassium salts if required Blood or plasma should be given according to indication In chloride de ficiency states normal or twice normal saline may be given intravenously until the urinary chloride output approaches 5 8 G daily Excessive salt dosage leads to waterlogging

Juxta pyloric gastric ulcers are difficult to cure by medical methods Any suggestion of chronicity is an indication for surgical treatment

6 *Ulcers where the supervention of malignancy is suspected* Surgical treatment (usually gastrectomy) is indicated

Gastric Carcinoma

Gastrectomy with complete dissection of the lymphatic drainage offers a reasonable prospect of cure in suitable cases Early diagnosis is a matter of great difficulty only by submitting patients in the stage of unconfirmed clinical suspicion to exploratory laparotomy rather than to a course of alkaline therapy can satisfactory surgical results be obtained in this disease

Total gastrectomy with œsophago jejunostomy may be followed by a dumping syndrome as well as dysphagia regurgitation steatorrhœa and emaciation Treatment is as described above

For advanced cases treatment is palliative Diet should be lightened according to the degree of discomfort present. Alkaline preparations are helpful and small amounts of morphine may be incorporated for relief of pain Morphine papaveretum or methadone by injection will assuredly be required later Amiphenazole (Daptazole Nicholas Labor atories) is a useful morphine extender (30 mg intra muscularly with each injection of morphine) Cyclizine (*Marzine B W*) *is also useful in preventing vomiting in* dosage of 50 mg with each injection of morphine Gastric

lavage is useful for persistent vomiting Palliative surgical measures such as short circuiting gastrostomy or gastrectomy (even if metastasis has occurred) may prevent or relieve distressing symptoms Radiotherapy is of little value

Acute Dilatation of the Stomach

May occur as a complication of abdominal operations or in the course of severe infections Mouth feeding should cease temporarily and glucose-salines must be given by intravenous drip careful watch being kept on the electrolyte status Gastric lavage and continuous suction are set up using a transnasal Ryle s tube Subcutaneous injections of neostigmine methylsulphate 0 5 2 mg at three hourly intervals may be of assistance

DISEASES OF THE INTESTINE

Constipation

Habitual constipation may be due to dysfunction of various portions of the alimentary tract, and careful physical examination including digital and endoscopic examination of the lower bowel and inspection of the stools should be made The patient s diagnosis is not necessarily justified and useful information can be obtained by giving a few doses of charcoal and noting the average time taken for this material to pass through the alimentary tract Examination by opaque meal and enema may indicate the site of a hold up or confirm a diagnosis of rectal dyschezia.

Sluggish bowel habit rarely warrants the serious prognosis with which the lay mind associates it Negative findings as regards organic disease should be communicated to the patient reassurance and peace of mind are notable adjuvants to therapy

In young subjects fresh air exercises such as walking cycling rowing swimming golf and gardening are helpful. In middle aged and inactive patients, mild outdoor recreations suitable diet remedial exercises and massage arranged to strengthen the abdominal musculature are of great assistance Abdominal belts are a confession of failure so far as the defaecatory muscles are concerned

Inculcation of an alarm clock habit should be the rule from earliest childhood A call to stool on rising is the most convenient and hygienic but many require the stimulus of an after breakfast cigarette The hour is immaterial so long as it is sedulously observed The average water closet is designed with little regard for physiological principles but the squatting posture can be achieved reasonably well by provision of a footstool

A liberal well mixed dietary is best and it should be made bulky by the inclusion of raw and cooked vegetables and fruits Wholemeal porridge pre-cooked bran and wheat germ preparations are acceptable to many patients Wholemeal bread and the various brands of crispbread have a useful cellulose content Strong tea and coffee should be forbidden Yoghurt and buttermilk are relished by some patients but they effect no appreciable alteration in the intestinal flora At least three pints of fluid should be drunk daily in addition to beverages taken with meals

Drugs have a minor rôle in the treatment of constipation except in elderly patients and immobile invalids as tolerance is quickly acquired leaving the sufferer in worse case than before The use of mild aperients may be necessary as a temporary expedient In cases of average severity the following remedies may be given singly in combination or in rotation

A glass of orange tomato grapefruit or pineapple juice with early morning tea

A helping of fruit or vegetable salad stewed prunes figs dates or apples with two meals daily

Compound Syrup of Figs B P C ½ 2 drachms twice daily

Confection of Senna and Sulphur B P C ½ 1 drachm twice daily

Senokot tablets Westminster Laboratories (a standardised senna preparation) 1-4 tablets daily More dependable than the official preparations

Liquid Paraffin and Magnesium Hydroxide Emulsion B P C 2 8 drachms daily

Paraffin is prone to leak through the anal sphincter and by its insulating action may interfere with absorption of fats and vitamins Methylcellulose suspensions are free from

these objections Blandlax Boots (methylcellulose plus magnesia) is a representative preparation Mucilaginous materials such as agar agar psyllium and bassora are occasionally useful as they contribute bulk and moisture to the stools

If the foregoing measures fail temporary resort may be necessary to a wider range of aperients including effervescent salines and Seidlitz powder sodium or magnesium sulphate cascara aloes and podophyllin. The effervescent salines are very popular and in small do age are harmless Inveterate constipates often do well on Liquid Paraffin Emulsion and Phenolphthalein B P C dose 1-4 drachms

Enemata are not desirable for routine use except in bed ridden patients or as preliminary treatment of rectal dyschezia. Where the rectum is loaded with scybalous masses 6 oz. of warmed vegetable oil or liquid paraffin should be injected and retained over night the softened bowel contents are then evacuated by soap and water enema aid d if necessary by gentle *morcellement* High colonic lavage is a pernicious addiction the more imaginative and colon conscious types of patient should be protected from its toils Glycerin suppositories and soap cones are for occasional use only like enemata their use tends to become a habit Bisacodyl Dulcolax Lewis Laboratories acts as an efficient contact laxative Tablets and suppositories are available

Spastic constipation usually co-exists with psychoneurosis A low residue diet is best. Liquid paraffin is the only permissible laxative Belladonna is useful in the treatment of spastic colon and may be given as gr ¼ of dry extract in pill twice or thrice daily or it may be used in combination with phenobarbitone and ergotamine e g Bellergal Sandoz.

Visceroptosis requires treatment as for constipation in general. Abdominal supports and belts are sometimes helpful. Setting up exercises and massage should be ordered to correct lordotic posture

Surgery has no place in treatment of chronic constipation, apart from relief of such conditions as hæmorrhoids, anal fissure diverticulitis and organic obstruction.

Acute Enteritis

Treatment of enteritis is directed primarily to the cause Irritative forms if seen early in the attack usually improve with a dose of castor oil In the presence of nausea or vomiting gastric lavage should be done Rest in bed warmth to the abdomen and a liquid diet (fruit juice diluted milk albumin water and weak tea) are usually curative Astringents *e g* Kaolin and Morphine Mixture B P C are less esteemed for diarrhœa than formerly but are useful for relief of pain and colic

Codeine gr ¼-½ by mouth thrice daily is helpful in the early stages

Sulphonamides such as succinylsulphathiazole and phthalylsulphathiazole in combination with sulphadiazine are valuable therapeutic weapons for treatment of acute bowel infections particularly those caused by dysenteric organisms Phthalylsulphathiazole should be used in initial dosage of 3 G followed by 2 G six hourly for two or three days The broad spectrum antibiotics are superior for treatment of some intestinal infections notably those due to enteroviruses Good results have been reported from the use of oxytetracycline (4 G in twenty four hours) for salmonella enteritis Erythromycin and neomycin have given good results in resistent staphylococcal enteritis Framycetin sulphate (Soframycin Roussel) has proved as effective as neomycin in infantile gastro-enteritis due to *Esch Coli* Dosage 125 250 mg (50 mg/kg) daily over three to twelve days (Louette *et al* 1958)

Toxæmia dehydration and collapse are features of severe and fulminant enteritis reliance should be placed upon blood or plasma glucose saline and corticosteroids by the intravenous route

Food Poisoning

Food poisoning cases may be divided on a bacteriological basis into three groups

Salmonella food poisoning Contamination usually arises during preparation and storage of food stuffs Processed meats are the commonest vehicles but milk and cream eggs ice cream and flour confectionery are occasionally respons

ible Explosive outbreaks of gastro-enteritis with vomiting diarrhoea cramps and colic leading to dehydration and prostration are common Treatment is by fluid diet with codeine or Tincture of Opium B P for pain. A broad spectrum antibiotic such as chloramphenicol (1 G orally and then 0 25 G six hourly) is useful In severe cases blood plasma crystalloids and water must be given intravenously to replace deficiencies

Staphylococcal food poisoning Due to enterotoxins elaborated by coagulase positive *Staph aureus* The source is usually septic lesions of finger throat or nose of food handlers Cooked and pressed meats are frequent vehicles also milk (bovine mastitis) Sudden violent onset after an incubation period of a few hours vomiting and diarrhoea are prominent

Treatment as above Erythromycin (1 G daily) is efficacious and in emergency may be given by vein

Botulism. Tinned or bottled meat or vegetables (particularly home bottled vegetables) may be contaminated with spores of *Cl botulinum* The exotoxin of this organism has a curare like action weakness of the ocular pharyngeal and respiratory musculature being due to interference with acetylcholine synthesis

Treatment consists of gastric lavage purgation and early administration of polyvalent antitoxin (50 000 units daily intramuscularly) Intravenous glucose saline is occasionally necessary neostigmine methylsulphate 0 5 2 mg intramuscularly and repeated as necessary will control the muscular weakness The causal organism is sensitive to penicillin and this remedy may have some scope in treatment particularly if the lung bases become moist

Acute Colitis

Acute catarrhal colitis may occur with acute enteritis Left abdominal colic and the passage of frequent small loose motions containing mucus and streaks of blood are common

Treatment as for enteritis Irrigation of the lower bowel with normal saline followed by a starch and opium enema (starch 4 oz. with tincture of opium 20 minims) gives considerable relief

An element of personality defect is apparent in cases of ulcerative colitis and precipitating factors such as emotional disturbance are common Physical and mental energy is sapped with progress of the disease and almost inevitably the victim becomes absorbed in his colonic miseries Formal psychotherapy is rarely acceptable but practical psychotherapy in the shape of sustained sympathetic interest on the part of the medical attendant and a patient optimistic attitude in the nurses and relatives is of great value Outside interests must be encouraged and congenial diversional therapy arranged

Local treatment In general undesirable and often productive of discomfort and exhaustion In the acute exacerbation of rectal or lower sigmoid lesions a gentle wash out with normal saline (2 pints) followed by a retention enema of starch mucilage 4 oz. with tincture of opium 20 minims will assuage colonic irritability and promote sleep If the stools are purulent or offensive gentle colonic irrigation with normal saline is useful and may be followed by a retention enema of 8 oz. of 3 per cent. aluminium hydroxide

Surgical treatment. Has gained favour during the past decade It should be considered in cases which have not made satisfactory response to medical measures within a reasonable trial period and in all cases of extensive colonic damage

Careful sigmoidoscopic and radiological examination is necessary in planning the operation Failure is likely where the ileum is involved and a progress meal with non flocculating radio-opaque suspension will decide the point

Ileostomy is an essential step in surgical treatment the large bowel is put at rest leading to rapid healing of the colonic lesions With aid of the modern spigot like ileostomy opening and the Koenig Rutzen bag good control of bowel function can be quickly gained and the improvement in the patient s health is often remarkable Restoration of bowel continuity even after several years quiescence is fraught with risk of relapse and present emphasis is therefore on colectomy which is usually done in two stages the first perhaps simultaneously with the ileostomy In a fortunate but small minority of cases an ileoproctostomy may eventually be possible these are usually in the short history group and it

has been objected that they would probably have recovered anyway Speculative criticism of this sort cannot detract from the excellence of surgical results in suitable cases (cachectic, toxæmic or moribund patients are not suitable)

Operative measures are imperative for such complications as acute perforation severe hæmorrhage pericolic abscess fistula, pseudopolyposis and malignant degeneration Arthritis of the dysenteric type and pyodermia occasionally occur and are usually considered indications for surgical treatment of the colitis

Regional Ileitis Crohn s Disease

A chronic inflammatory condition of unknown ætiology affecting the ileum although widespread lesions from jejunum to cæcum are not rare General measures are employed as in ulcerative colitis to improve nutrition combat anæmia and lessen toxæmia. Complete rest in bed is desirable when the disease is active Diet should be bland but high in caloric value unless steatorrhœa is present ordinary fat intake is permissible Liquid iron and multivite preparations are given routinely and for control of diarrhœa, courses of phthalylsulphathiazole and small doses of codeine are best Antibiotics and adsorbents like bismuth chalk and kaolin have proved disappointing Blood transfusion and electrolyte replacement are important and valuable contributions to therapy Some success has attended administration of corticosteroids but experience is still meagre

Surgical treatment is essential for refractory bowel hæmorrhage stenosis obstruction perforation and fistula tion. Excision is done for strictly localised disease and sometimes ileo-transverse colostomy to exclude an actively diseased loop of bowel which may be removed later Relapse is unfortunately common

Idiopathic Steatorrhœa Non tropical Sprue

Has many features in common with tropical sprue emacia tion megaloblastic anæmia (occasionally hypochromic) and steatorrhœa. Absorption of all three types of foodstuff is defective likewise absorption of vitamins and minerals, notably calcium and iron

Dietetic and medicinal treatment are on the lines suggested for the tropical variety A high-caloric low fat diet is usually acceptable a vitamin quota and iron by mouth are aids to improved nutrition Gluten free diet has been found valuable in these conditions although response is slower than in cœliac disease Folic acid in dosage of 5 15 mg daily by mouth helps to correct the abnormal intestinal motility pattern and will remedy megaloblastic anæmia which is common Proteolysed liver preparations brewer s yeast and Marmite are also valuable For refractory hypochromic anæmia intramuscular iron (Imferon Benger) say a course of 10 bi weekly injections is best Owing to increased fæcal loss a potassium deficiency may arise resulting in apathy muscular hypotonus and loss of electrocardiographic voltage replacement therapy is indicated

Emulsifying agents have been used in malnutrition from the defective fat absorption common to sprue steatorrhœa cœliac disease and after certain surgical procedures such as gastrectomy short circuiting and excision of the small bowel Sorbitan polyoxethylene monooleates (Sorlate Abbot Prosparol Duncan Flockhart) are representative preparations

Diverticulitis

This condition may produce abdominal symptoms of severity varying from constipation with colicky pain in the left lower abdomen to localised phlegmonous peritonitis In the absence of inflammatory complications the diverticulosis is often silent constipation is the symptom for which the patient is likely to seek advice High residue diets cause discomfort and bland foods are indicated The bowel contents must be kept soft by dosage with liquid paraffin before meals Occasional oil and saline enemata are useful but aperients producing watery stools should be prohibited

Localised peritonitis demands treatment by rest in bed fluid diet and administration of chlortetracycline chloramphenicol or neomycin Resistant cases and those showing fistulous involvement of the bladder require surgical drainage transverse colostomy is indicated for obstruction Occasionally the affected portion of bowel is small enough to make excision and end to-end anastomosis feasible

CHAPTER VII

DISEASES OF THE LIVER

Jaundice

There are three types of jaundice

Obstructive—following mechanical blockage of the biliary tract by impacted gall stones pancreatic neoplasm, enlargement of lymph glands in the portal fissure etc

Toxic and infective—due to injury of the hepatic cells by chemical or organismal toxins e g arsenic carbon tetrachloride chlorpromazine Weil s disease infective hepatitis

Hæmatogenous—follows increased destruction of erythrocytes with liberation of excessive amounts of bile pigments e g Addison s anæmia malaria Hæmolytic jaundice requires no treatment other than that of the anæmia.

The general treatment of jaundice is

1 Rest in bed until the skin shows little icterus and the urine is bile free

2. Diet should consist mainly of protein and carbohydrate and be liberal varied and appetisingly served Initial restriction of fat confers no hardship as it causes nausea and indigestion Adequate fluid intake is essential

3 Drugs are used mostly for symptomatic indications Alkalis and bitters may be given to allay nausea and promote appetite Magnesium sulphate was formerly used to encourage biliary flow where stasis rather than obstruction is present. (Dosage of 1 2 drachms in concentrated solution on waking followed in twenty minutes by a tumblerful of hot water) Bile salts are more effective and are best given in capsule form, e g Desibyl P.D two thrice daily The pruritus of obstructive jaundice can be distressing and is lessened by administration of an antihistamine such as diphenhydramine hydrochloride and application of starch or calamine lotion. Severe or persistent jaundice especially if due to chemical toxicity or hepatitis often clears under

with vitamin concentrates particularly vitamin B Attention should be devoted to the digestive functions Anorexia and dyspepsia are mitigated by alkalis and bitter tonics Many cirrhotics are achlorhydric but few derive benefit from acid pepsin mixtures Regular bowel action may be secured by nightly doses of liquid paraffin Infections may be latent and all are potentially dangerous in hepatic cirrhosis Active treatment should be promptly given. Sedatives particularly morphine are best avoided paraldehyde and soluble phenobarbitone are safest

Hæmatemesis is an alarming incident and should be dealt with as described in page 109 but morphine is avoided if possible The dangers of excessive transfusion in this condition include dilution of circulating clotting factors increasing potential amount of bleeding into gastrointestinal tract risk of hepatic coma and citric acid intoxication A Sengstaken tube bearing a wide inflatable cuff provides direct compression of the varicose area of the lower œsophagus A gastric balloon at the tip ensures its retention inside the cardia and effective positioning of the œsophageal cuff gastric content can be aspirated through the tube Obliteration of the œsophageal varices by ligature or injection of sclerosing solutions has been resorted to with doubtful results Recurrent hæmorrhage is an indication for a shunt operation

Hepatocellular failure may be a prominent feature and calls for bed rest liquid diet with restriction of protein according to the degree of failure as in hepatic necrosis Nitrogen-containing medicaments are avoided and glucose vitamin infusions given Once the mental state clears protein is cautiously restored to the diet

Portal hypertension is a troublesome feature of some cases of hepatic cirrhosis It may lead to ascites and œdema or to the more fatal complication of hæmatemesis from ruptured œsophageal varices The blood protein meal subsequently absorbed from the gut gives rise to portal-systemic encephalopathy Surgery offers substantial prospects of relief in suitable cases *i e* those in which a reasonable quantum of liver function remains jaundice ascites hepatic coma hypoproteinæmia and hypoprothrombinæmia unless reversible

are contra indications Various operations are used *e g* lienorenal and portocaval anastomosis for extra and intra hepatic obstruction respectively

Ascites and œdema increase the patient s discomfort and must be relieved. Fluid intake is temporarily restricted salt has already gone the way of other condiments If the renal function is good mersalyl 1-2 ml intramuscularly may be tried and if succes ful repeated at intervals of four to six days according to progress Chlorothiazide Saluric Merck Sharp & Dohme is useful for control of hepatic anasarca in dosage of 1-4 0 5 G Tablets daily Hypokalæmia must be guarded against. Intravenous dosage with salt reduced human serum albumin (50 G daily for ten days or more) is temporarily effective against anasarca in hepatic cirrhosis If these measures fail paracentesis should not be delayed although over frequent repetition causes undue depletion of serum proteins Frequent change of decubitus after paracentesis will encourage mobilisation of œdema fluid from the lower limbs but multiple skin punctures or Southey s tubes may be necessary

Cholecystitis

Acute Mild and uncomplicated attacks of gall bladder inflammation often subside under a medical regimen Complete rest in bed is enforced and diet consists of fluids only Sweetened fruit drinks barley water diluted milk and weak tea are suitable Diet may be cautiously resumed when the force of the attack is spent Vomiting or gastric distension should be met by an indwelling nasogastric tube withdrawal of mouth feeding and setting up a glucose saline intravenous drip Hot applications to the upper abdomen are useful for relief of pain, but one or more injections of morphine and atropine or pethidine may be required during the stage of activity

Simple cholecystitis may become an immediate surgical proposition on account of suppuration, perforation or gangrene of the gall bladder The risk of spreading peritonitis can be reduced by the use of chloramphenicol or oxytetracycline as a pre- and post-operative routine Unless contra indication exists, the gall-bladder should be removed in a quiescent phase.

Chronic Manifests itself by nausea flatulent dyspepsia and distaste for fatty foods Pain either localised or referred with tenderness over the gall bladder area is common particularly during subacute exacerbations A characteristic history definite physical findings and cholecystographic abnormality are diagnostic but radiological evidence is not always clear-cut in the absence of stones diagnosis may be very difficult

Cholecystectomy is the only satisfactory remedy particularly if gall stones are present The following routine may be tried in patients who are unfit or unwilling for radical cure

Diet should be light and digestible Cholesterol-containing foods such as egg yolk cheese pork liver kidney sweet bread fish roes cream and suet are forbidden. Lean beef lamb ch cken and white fish are allowed Frying and greasy methods of cookery should be avoided Carbohydrates are harmless butter or vegetable fat may be used sparingly *Vegetables often aggravate dyspepsia*

Magnesium sulphate may be given in dosage just short of producing liquid stools It is taken in as little hot water as will dissolve the crystals on waking The patient lies on his right side for twenty minutes and then drinks a pint of hot water Olive or other vegetable oil (3 drachms) may be given fifteen minutes before three meals daily as a cholagogue Troublesome flatulent dyspepsia should be met by temporary restriction of diet and the administration of alkaline sedative mixtures Some patients find relief from dyspeptic symptoms by taking bile salts (*dehydrocholic acid gr 4-8 in capsule* thrice daily)

Gall Stones

Medical treatment aims at immediate relief of colic and alleviation of coincidental inflammation of the bile tract

For colic rest in bed and warmth to the abdomen are indicated Diet should consist of liberal quantities of bland fluids for some days after the colic has subsided Morphine gr $\frac{1}{4}$-$\frac{1}{2}$ or Papaveretum Injection B P C 1 ml with atropine gr [illegible] *will usually relieve the pain although a short inhalation* of chloroform may be necessary until the sedative takes effect Pethidine hydrochloride 100 mg and methadone

10 mg are both effective when given into a muscle or slowly into a vein Other suggestions are calcium chloride 20 ml of 5 per cent solution intravenously (slowly) papaverine sulphate gr 2-4 orally or gr ½ subcutaneously aminophylline 0 25-0 5 G intravenously (slowly)

The patient should remain in bed until pyrexia icterus and gall bladder tenderness have disappeared Return to solid diet must be gradual and further management of the case is similar to that of cholecystitis

In view of the risks associated with the ownership of gall stones surgical treatment ought to be considered in all cases without serious contra indication Operation is imperative for

Severe persistent or recurrent colic, palpable or persistently tender gall bladder prolonged or recurrent jaundice or other sign of impaction, perforation or suppuration of the gall bladder

Pancreatic Disorders

Acute hæmorrhagic pancreatitis is a rare but serious surgical emergency Early treatment is usually non operative gastric suction morphine or pethidine for relief of pain atropine to reduce pancreatic secretion blood and glucose salines by intravenous drip to combat dehydration and peripheral circulatory failure and antibiotics to control infection J G Brokis and E T Jones (1956) used cortisone (300 mg daily reducing over several weeks) as an anti-shock measure

Recurrent pancreatitis is associated with reflux of bile into the gland due to stone in the ampulla of Vater or cholangitis with spasm of Oddi s sphincter Such episodes may lead to pancreatic necrosis For the acute phase conservative measures are best—gastro-duodenal aspiration antibiotics and pethidine or atropine for pain Laparotomy should be done in a quiet interval with exploration of the common bile duct and sphincterotomy via the duodenum

Chronic pancreatitis syndromes are by no means clearly defined Fibrosis of this organ occasionally follows acute infectious diseases it may occur alone or in combination with achlorhydric gastritis and hepatic cirrhosis Pancreatic

insufficiency may cause diabetes steatorrhœa pancreatic calculi or calcification and several of these may occur in combination

The diabetic condition calls for treatment on the usual lines For steatorrhœa dietetic regulation similar to that described for sprue is suitable and oral dosage with pancreatin should be tried Panteric Compound tablets P D contain pancreatin and bile salts

Hepatomegaly and jaundice sometimes occur in association with chronic pancreatitis and such cases are liable to be mistaken for neoplasm of the gall bladder or pancreas Surgical drainage of the gall bladder into the duodenum affords permanent relief

CHAPTER VIII

DISEASES OF THE PERITONEUM

Acute Peritonitis

This may follow hæmatogenous infection, injury or inflammation of the abdominal or pelvic organs or penetrating abdominal wounds. Early laparotomy is essential in most cases and a ruptured viscus should be repaired or removed. A localised appendicular abscess usually requires drainage, the appendicular stump being removed at a later date. Pneumococcal peritonitis is commonest in female children and the infection may be blood borne or from the genital tract. It responds well to combined sulphonamide and penicillin therapy but simple drainage is usually necessary as well. Gonococcal peritonitis occurs by direct spread from the Fallopian tubes and tends to localise in the pelvis. Surgical treatment can often be delayed until the inflammatory process has subsided.

Medical treatment is in general subsidiary to surgery. The patient should be propped up in Fowler's position in order to limit the inflammatory process as far as possible to the more tolerant pelvic peritoneum. Once the diagnosis is established morphine may be used in quantities sufficient to relieve pain. Aperients are contra-indicated but a small tap water enema may be ordered if necessary. Fluid by mouth should be interdicted, and glucose salines given by intravenous drip to counteract dehydration and chloride loss through vomiting. Continuous gastric or intestinal suction is useful for relief of abdominal distention.

Choice of antibiotic is governed by sensitivity of infecting organisms but parenteral administration of tetracycline or neomycin is advisable at the outset. Oral dosage is substituted as soon as the need for gastric aspiration has passed.

Gas gangrene antiserum is useful for diminution of toxæmia caused by intestinal ileus. Blood transfusion is an

excellent measure during both the early and post operative phases

Chronic Peritonitis

The localised form may follow inflammatory lesions or surgical interference Abdominal pain and constipation are usual symptoms Tonic measures *abdominal massage and* exercises are sometimes helpful bowel regularity may be secured by administration of small doses of a liquid paraffin preparation

Operative treatment is rarely beneficial except in the presence of obstructive symptoms

Diffuse chronic peritonitis is usually a manifestation of polyserositis Ascites is a common feature for which para centesis is necessary Other measures such as low sodium diet and diuretics should be tried (See p 191)

Tuberculous Peritonitis

May be primary but is more commonly secondary to tuberculous infection of mesenteric lymph nodes or a genito urinary focus Search should be made for tuberculous manifestations elsewhere

The routine described for pulmonary tuberculosis is applicable During the febrile stage complete rest in bed a nourishing low residue diet and fresh air are indicated Tonics of iron and fish liver oil are valuable once signs of recovery appear Sunlight and ultra violet therapy have a good tonic effect but they must be employed with caution until indivi dual response can be judged Diarrhœa may be a troublesome feature which calls for temporary lightening of the diet with restriction of fats Astringents such as chalk and opium or kaolin may be given for short periods Constipation can be relieved by small doses of liquid paraffin Ascitic collections require aspiration Intestinal obstruction sometimes super venes and surgical relief must be attempted Abscess and fistula formation are serious complications which require surgical treatment

Beneficial results have been reported from streptomycin employed in conjunction with the general tonic measures mentioned above Dosage is 1 G daily intramuscularly for

the first two to four weeks and reduced to once or twice weekly when immediate objectives have been gained PAS or isoniazid is given concurrently

Surgical treatment apart from the complications mentioned above is in general unwise although undoubted benefit attends the removal of a localised focus *e g* Fallopian tube

CHAPTER IX

METABOLIC DISEASES

Diabetes Mellitus

When confronted with a glycosuric patient the first step is to make certain that he is truly diabetic In renal glycosuria the kidney threshold for glucose is lower than the usual 180 mg per cent but the blood sugar range is normal In the lag type of diabetes the liver storage mechanism comes into action more slowly than glucose is absorbed from the bowel and transient glycosuria appears after meals Diabetes insipidus and pituitary diabetes connote no pancreatic defect Transient glycosuria may occur in septic states after intra cranial lesions and in pregnancy and is not significant Cases of renal glycosuria and those showing lag curves should be re-examined at intervals as they sometimes develop diabetes mellitus in the course of years

The young diabetic is occasionally resentful of a regimen which is at times irksome In justification of the therapeutic yoke (lighter though it becomes with each advance in technique) are two considerations the phenomenal increase in life expectancy and the long term prospect of greater freedom from vascular degenerative complications such as retinitis hypertension and nephrosclerosis in those who remain in adequate control

Regular testing of the urine for sugar and ketones is necessary and in conjunction with blood sugar estimations at various times of the day will enable the practitioner to gauge the patient's response to treatment A glucose tolerance test if practicable at the outset of treatment, is the best guide to the state of the patient's carbohydrate metabolism and his therapeutic requirements The patient should have unrestricted carbohydrate for several days before a sugar tolerance test is done The diabetic blood sugar curve will show a fasting level of over 100-130 mg per cent The peak

reading following 50 G of glucose by mouth will exceed 180 mg per cent after 1½ hours instead of returning to approximately normal level the peak value is substantially maintained and after 2½ hours the blood sugar will still exceed 150 mg per cent If renal function is normal sugar will be found in the urine for ½-4 hours after the test and ketones will be present in all but mild cases Apart from information regarding the renal threshold a single blood sugar determination two hours after 50 G glucose is equally useful

Diabetes is a disease of infinite variety in children and young adults it is usually severe whereas in elderly gouty and obese subjects it is often mild Individual response is to some extent incalculable but a patient whose fasting blood sugar is around 160 mg per cent without ketonuria and with little in the way of symptoms can often be stabilised by diet alone

The calorific value of the diet should vary according to the patient s predicted needs and obese or undernourished subjects improve on diets calculated to reduce or increase their respective weights Obese subjects may lose their diabetic manifestations when the weight has been suitably reduced Other factors are age sex and surface area and in practice the adult basal requirement can be reckoned as 11 3 calories per lb body weight *i e* a man weighing 156 lb needs 1 763 calories If however he has to expend con siderable muscular energy this basic figure must be doubled (3 526 cal) The protein intake should be about 0·5 G per lb body weight and so the man of 156 lb needs 78 G daily

Carbohydrates are inefficiently oxidised in the muscular tissues in diabetes and it was formerly the practice to restrict them drastically and to make up the requisite calories by increasing the fat content This made for un palatability of the diet and conduced to ketosis and coma. Extended experience with insulin has shown that liberal carbohydrate allowances enhance physical and mental wellbeing and improved tolerance usually follows It is wise therefore to give at least twice as much carbohydrate as fat

In the example of the 1 763 cal diet

78 G	protein =	78 × 4 1 =	320 cal
190 G	carbohydrate =	190 × 4 1 =	779
71 G	fat =	71 × 9 3 =	660
			1 759 cal

A selection of foodstuffs having a calorific value of 1 750 and a protein content of 78 G would be made from a Com position of Foods Table *The patient may then arrange his* daily menu in accordance with seasonal availabilities by aid of a Table of Comparative Food Values

In practice it is unnecessary to work out individual diets A ready made one suitable in caloric content to the patient s age size work and diabetic condition can be adjusted in accordance with his gastronomic preferences

There is little to be gained by starting on a low diet and working up if the patient is otherwise healthy much time will be saved by commencing with a diet which approximates his usual requirements Reasonably accurate control can be maintained if the urine passed immediately before meals is tested for sugar and ketones and blood sugar estimations are done every two or three days until stabilisation has been effected (The bladder should be emptied half an hour before the before meal specimens of urine are passed) If morning fasting and before supper blood samples are taken on one occasion and on the next midday and bedtime samples a general idea of the blood sugar behaviour is obtained In a well stabilised patient the intervals between estimations may extend to one to three months and on these occasions the *before breakfast midday and bedtime blood sugar* values will indicate whether minor modifications in diet and insulin are desirable If the renal threshold is normal and the before meal urines are consistently sugar free the in tervals between blood sugar tests may be considerably longer

The patient should if possible be up and active during the stabilisation process thus obviating the necessity for re stabilisation later He should be taught to weigh his diet and test the urine insulin recipients are taught the technique of self administration

A patient who is inadequately controlled by dietetic regulation should be given insulin Several types are available ordinary soluble insulin (20 40 and 80 units per ml) protamine zinc insulin (40 and 80 units per ml) which has a slower but prolonged action and globin insulin (40 and 80 units per ml) the action of which is intermediate in type and which causes less local reaction than protamine insulin Isophane insulin (N P H) is a slow action insulin containing crystalline protamine It has many advantages including neutrality and the hypoglycæmic effect resembles a 2 1 soluble P Z mixture The protamine content is exactly covered by the insulin and soluble insulin may be safely added if necessary We have found it suitable for most diabetics. Novo insulin (I.Z.S) has the advantage of being protein free and rarely provokes sensitivity reactions The buffered insulin suspension can be prepared in either amorphous form Insulin Zinc Suspension (Amorphous) (*Insulin Semilente*) which has a relatively rapid action akin to that of soluble insulin or in crystalline form Insulin Zinc Suspension (Crystalline) (*Insulin Ultralente*) which acts for a prolonged period like protamine zinc suspension A standard mixture of 30 per cent amorphous and 70 per cent crystalline form Insulin Zinc Suspension (*Insulin Lente*) combines the advantages of both and has an action resembling that of SI PZ mixtures Novo insulins are available in strengths of 40 and 80 units per ml and are miscible in all proportions but they must not be mixed with any other type

Ordinary insulin exerts its maximum effect in two hours and its total effect inside five hours so that it looks after one meal only Globin insulin produces a more gradual fall in blood sugar and is active during the third to eighteenth hours after injection The action of protamine zinc insulin is more prolonged and covers the period between the sixth and twenty fourth hour after injection. The slowly acting insulins have the advantage that after a lag of two to four hours a morning dose will influence the blood sugar curve for the remainder of the day This depôt effect is more physiological than the short lived one of soluble insulin and in suitable cases one dose daily will suffice Their disadvantage is that if hypoglycæmia occurs it may be prolonged with

globin insulin the usual time for hypoglycæmic reactions is in *the afternoon but these can be averted by allotting* about 20 per cent of the daily carbohydrate allowance to the afternoon tea meal Protamine zinc reactions are liable to occur during sleeping hours when they may go unrecognised This dangerous possibility is avoided by reserving 20 per cent of the carbohydrate for a bedtime meal

The following table shows the approximate distribution (per cent) of carbohydrate appropriate to various types of insulin dosage

	Breakfast	Lunch	Afternoon Tea	Supper	Bedtime
Soluble insulin	↑35	15	7	↑35	8
Soluble+protamine	↑⍏20	25	10	25	20
Insulin Lente	*⍏15*	*25*	*20*	*20*	*20*
Isophane	⍏20	30	20	30	—

Mild cases with daily insulin requirement of up to 30 units do well on any type of insulin but one dose of isophane insulin before breakfast is usually satisfactory and more convenient than a dose of soluble insulin before breakfast and supper For cases requiring 40 100 units daily good control may be achieved with a combined dose of soluble and protamine zinc insulins before breakfast Some severe cases respond better to two doses of globin or isophane insulin (before breakfast and afternoon tea)

Unless the patient is elderly and non ketotic it is usual to stabilise with soluble insulin and when his requirement has been gauged to substitute partly or wholly with slow acting insulin The former is more effective against ketosis the latter gives better overall control and smaller dosage should be allowed initially *Temporary glycosuria after meals* is common with slow action insulins but this may be disregarded if the blood sugar levels are satisfactory Soluble and *protamine zinc insulins should not be mixed in the syringe as* the latter contains excess of retarding agent and there is risk of part of the former becoming slow acting Double and *quadruple strength insulins are a desirable refinement*

provided the patient understands the simple calculation involved.

Some improvement in the diabetic condition may be looked for after a few weeks careful treatment and this entails adjustment in diet or insulin Moderate cases often recover sufficient carbohydrate tolerance to enable them to dispense with insulin

Insulin sensitiveness A few individuals become allergic to contaminant proteins and the phenomenon is more likely to appear where the use of insulin is resumed after a lengthy interruption The patient should be tried on Lente insulin if unsuccessful desensitisation may follow a rapid course of graduated intradermal injections commencing with 0 001 unit of insulin Anti histamines are reported to be useful for this variety of allergy

Insulin insensitiveness Himsworth has distinguished two types of diabetes by means of his insulin-glucose tolerance test insulin sensitive and insulin insensitive The former are young insulin-deficient diabetics the latter are mostly elderly obese subjects in whom insulin over-dosage does not readily produce hypoglycæmia Diabetes complicating other endocrine disturbances such as acromegaly and Cushing's syndrome is frequently insulin insensitive Patients occasionally develop temporary insulin resistance for no obvious reason. Change of type of insulin should be tried

Sulphonylureas. Non bacteriostatic sulphonylurea products have been used to reduce the blood sugar range of mild obese and relatively recent diabetics who remain hyperglycæmic after weight reduction. The method is unsuitable for young insulin-deficient diabetics and for those with ketosis or infection. The patient should be over 40 free from complications have a fasting blood sugar of under 300 mg per cent and require less than 40 units of insulin daily Tolbutamide (Orinase Upjohn Rastinon Hoechst) is given orally first day 3 G second day 2 G third day 1 G and then 1 3 G daily in divided dosage after meals Skin rashes and leucopenia have occasionally complicated

The rehydration process can be simply controlled by plasma specific gravity readings If the blood pressure remains low concentrated plasma with noradrenaline may with advantage be added to the drip 100-400 units of soluble insulin should be given, one half intravenously and the remainder subcutaneously and 50 units intravenously half hourly until Rothera s test becomes negative A further subcutaneous dose of 100 units may be required if the initial blood sugar level was high (500-600 mg per cent) Warmth and quiet are essential

As soon as swallowing power is re͏gain d ½ oz. doses of glucose in 10 oz. water suitably flavoured are given hourly until sugar appears in the urine and ketones disappear The blood sugar estimation is repeated when oral therapy recom mences and further insulin dosage regulated accordingly The wisdom of administering glucose to the already hyper glycæmic patient has been called in question but it can be given with safety when hypochloræmia and hæmoconcen tration have been corrected

During the next twenty four hours if the general condition is good the patient may be offered a light diet with 40-80 units of insulin daily in four to six divided doses If as is often the case he is weak and tired 3 pints of milk containing 4 oz. of glucose covered by 60-80 units of insulin will tide him over the immediate recovery stage when a light diet may be substituted After twenty four to forty-eight hours he should be ready to proceed to a standard diet at this stage further blood sugar estimations will give an indication of insulin requirements Some return of ketonuria may attend the resumption of fixed diet but a temporary allowance of 1 2 oz. glucose will overcome this disquieting phenomenon A careful search for inflammatory foci should be mad as they are the commonest precipitating factors in diabetic coma

Surgery in diabetes Infections anæsthetics and post operative starvation may induce coma in any diabetic indiv dual Elective anæsthes a and surgery should await control of the diabetic cond tion. For operations unlikely to last over two hours they should be done early in the morning if possible and no diet glucose or insulin given until the

patient has regained consciousness in severe diabetes and prolonged operations, it is customary to give 50 G of glucose by vein with 25 units of insulin subcutaneously one hour before operation Later the patient is given the glucose value of his ordinary diet in milk and other fluids with the usual insulin allowance in four to six divided doses daily Subsequently a light diet containing the carbohydrate value can be used until resumption of his ordinary diabetic routine becomes possible

With regard to anaesthetics lipoid soluble drugs such as chloroform ether Trilene and cyclopropane are unsuitable for use in diabetics and bromethol should be avoided whenever possible Sodium thiopentone gas and oxygen spinal and local anaesthetics are safe

Vascular degeneration is a common hazard in elderly diabetics Renal intracapillary glomerulosclerosis gives rise to the Kimmelstiel Wilson syndrome characterised by albuminuria oedema hypertension retinopathy and gross renal function defect Modification of the diabetic dietary to suit chronic nephritis is a matter of considerable difficulty

Diabetes in children The disease is more dangerous and more difficult to regulate on account of the proportionately higher and comparatively unstable metabolism of childhood. Glycogen storage is poorer than in adults and there is greater variation in physical activity The processes of growth and maturation also make for unstable metabolism The methods of control are the same as for adults, but carbohydrate and protein allowances must be relatively more liberal For example in children of average build requirements are in the region of

aged four years 40 calories and 1 5 G protein per lb body weight 130 G carbohydrate.

aged eleven years 33 calories and 1 2 G protein per lb body weight. 160 G carbohydrate

Insulin is almost invariably required, and the combined soluble-protamine arrangement prevents morning glycosuria and ketosis During the course of gastro-intestinal upsets and acute infections the light diet or the sugar equivalent should be given with normal insulin dosage Carbohydrate tolerance

usually contracts during the pubescent process and re expands afterwards The diet and insulin prescriptions should be reviewed regularly and adjusted in accordance with progress of the disease and of growth need

Pregnancy in diabetes There is evidence that women in the pre-diabetic state are more prone to complications of pregnancy (particularly fœtal giantism) than those who do not later develop diabetes Treatment by insulin has greatly increased fertility in diabetic women Pregnancy connotes a slightly increased risk to the mother s life but that to the fœtus is in the region of 25 per cent despite modern methods of treatment. The increased metabolism associated with pregnancy the dangers of coma toxæmia and sepsis and the disturbance of sugar metabolism incidental to lactation have all to be reckoned with

Ordinary diabetic diet and insulin dosage are usually satisfactory for the first trimester of pregnancy later the protein requirement will increase to 0·75 G per lb body weight and the total calorie intake by 15 20 per cent These may be partly provided by 2 pints of extra milk daily Severe hyperemesis may compel temporary use of the carbohydrate or glucose equivalent and divided insulin dosage

In addition to the routine watch on renal function daily urine tests for sugar and ketones and regular blood sugar estimations are essential

Hydramnios and fœtal overgrowth are prone to occur and there is much to be said in favour of delivery by cæsarean section not later than the thirty seventh week Infants tend to be hypoglycæmic on account of pancreatic over stimulation by maternal hyperglycæmia and early feeding with glucose may be necessary Lactation may provoke maternal hypo glycæmia and if allowed to continue insulin dosage must be revised

Hæmochromatosis A condition of increased iron storage in the body with deposition of hæmosiderin and reactive fibrosis in liver pancreas thyroid pituitary testes and heart Slate grey skin pigmentation hepatic cirrhosis diabetes and hypogonadism are characteristic Increased dietary iron intravenous iron and frequent blood transfusions may lead to a similar state

For the idiopathic variety a diet containing 100 G protein and poor in iron should be ordered The body iron stores can be depleted by 500 ml venesections at weekly intervals until a state of mild anæmia (Hb 10 11 G per 100 ml) is reached After this infrequent venesections (1 2 litres yearly) will maintain the patient in reasonable iron balance

Gout

The sufferer should have complete re t in bed during the acute phase The fluid intake should reach 5 7 pints daily and the diet consist of milk barley water vegetable b oth soda water and fruit juice Free bowel action is important, and a Rhubarb Compound Pill B P C followed by a saline will serve The painful limb should be elevated on pillows or light splint and pressure of bed clothes avoided by the use of a cradle The painful joint may be bandaged lightly with cotton wool but alkaline fomentations evaporating lotions or kaolin poultice are preferred by some victims Physiotherapeutic methods such as massage radiant heat and short wave diathermy are best omitted

Colchicum is a traditional remedy and Colchicum and Sodium Salicylate Mixture B P C may be taken three hourly until relief is obtained

Prolonged use of this drug is liable to provoke diarrhœa Colchicine is more reliable in action than the galenical preparations Dosage of 0 5 mg every hour or 1 mg two-hourly should be continued until pain disappears or diarrhœa supervenes. In subsequent attacks the dose just short of causing in esti nal irritation may be reached rapidly with correspondingly early reli f If severe diarrhœa results it is controllable by tincture of opium in 20 minim doses Salicylates have some effect in promoting uric acid excretion but they are rarely satisfactory as analgesics in the acute phase and a subcutaneous injection of morphine or methadone 10 mg intramuscularly may be de irable at the outset of treatment Phenylbutazone (Butazolidin Geigy) 200 mg six hourly for 8 10 doses is effective in treatment of acute gout ACTH gel (100 units intramuscularly) and prednisone (40 mg daily orally) have been used alone or in combination with colchicine or phenylbutazone

For interval treatment a hygienic mode of life should be enjoined with attention to such details as avoidance of chill moderate daily exercise and regular bowel elimination Obesity if present call for correction and concomitant conditions like arthritis diabetes and arteriosclero is should have adequate treatment Alcohol and purin-containing beverages are interdicted Over indulgence in flesh foods is harmful and it was customary to proscribe the following liver sweetbread kidney sardines herrings fish roe game soups and sauces made from meat stock rhubarb spinach watercress mushrooms peas and beans Diminution of fat intake with increase of carbohydrate tends to reduce the frequency of attacks Bland fluid and alkaline waters may be drunk freely and they acquire additional merit when taken as part of a spa routine

Salicylates diminish reabsorption of uric acid in the renal tubule and by lowering blood uric acid levels in chronic gout the patient s condition is improved and acute attacks reduced in frequency and severity Sodium salicylate gr 80 may be given daily for several months together with a vitamin K preparation Colchicine (0 5 mg once or twice daily) and probenecid (0 5 G twice or thrice daily) are excellent in combination for interval treatment of cases showing frequent or severe attacks The lowest effective dosage should be maintained over years un il the gouty tendency has waned Uricosuric agent hould be used cautiously in patients with a tendency to urate tone formation

Obesity

The influence of heredity age race and endocrine activity is important and uncontrollable but by ceaseless attention to diet and exercise the patient can do much to neutralise their effect The only proven cause of obesity is excessive food intake Gluttony is often a solace against an unsatisfactory milieu the individual who is unfortunate in love at games or n the occupational sphere can at least become a notable trencherman There i also the persistent fiction that obesity is synonymous with serenity good cheer and dependability

Alcohol should be forbidden in all cases of obesity Some sufferers consume large quantities of water and/or salt for these strict limitation of intake must be practised Mild and early cases do well on a dietetic regime in which protein and inert foods are substantially increased with corre sponding reduction of fat and carbohydrate

Grossly overweight subjects benefit from a course of in patient treatment They should be made aware of the poor life expectancy associated with the disease Psychological insight and re motivation towards an attractive figure and sati factory health status should be encouraged to ensure the patient s active co-operation. The first few days are spent in bed and a fast diet given This consists of one grapefruit or two oranges water weak tea and coffee with milk and saccharin vegetable or meat bro h jellies made with gelatin and saccharin shredded lettuce or cabbage cress or other green vegetable wi h mineral oil and vinegar dressing A weighed low calorie diet is then allowed for four-day per ods with a fast day between Another successful hospital routine is the 600 c. 200 c diet on alternate days

Thyroid extract is a traditional remedy but one of doubt ful efficacy The commencing dosage may be gr 1 daily cautiously increased to gr 3 In resistant cases progress can often be initiated by the exhibition of mercurial diuretics and ammonium chloride In the absence of contra indications 2 ml of mersalyl may be given intramuscularly twice weekly for six doses with coverage of ammonium chloride

When a satisfactory weight loss has been recorded, the patient is discharged on a low calorie diet with which he must be content until the adipose tendency is lost—often a matter of years Many find a weekly fast day a useful corrective and it need not be spent in bed Thyroid feeding may be continued in moderate dosage if required, but the patient should not be allowed to regard it as a substitute for dietetic austerity Dexamphetamine sulphate is useful for dulling the pangs of appetite and promoting euphoria and is generally preferable to thyroid extract. The dose is 2 5 5 mg. before breakfast at 11 a.m. and at 4 p m Preludin Pfizer acts similarly but has no hypertensive effect dose one 25 mg. tablet before breakfast and lunch

Open air exercise is an important detail of treatment although markedly inferior to dietary regulation as an aid to weight loss It has been brought to a fine art by professional weight losers such as jockeys and pugilists Walking, golf tennis squash racquets swimming gardening football and soft ball are excellent Massage and remedial exercises restore muscle tone and improve peripheral circulation although fat cannot be massaged away

CHAPTER X

DISEASES OF THE DUCTLESS GLANDS

THYROID GLAND

Simple Goitre

In areas where the condition is endemic the prophylactic administration of small quantities of iodine to children and expectant mothers has given good results The dose need not exceed gr ½ of sodium iodide daily for periods of ten weeks during the spring and autumn The use of iodised table salt is a convenient method of dosing the whole population (5-10 mg. potassium iodide per kg of salt) Thyroid enlargement of puberty and pregnancy should as a rule be left alone Diffuse goitre of short duration sometimes disappears under treatment by thyroid extract gr 1 3 daily

Operation is advisable for large and long standing goitres for those showing nodules and for cosmetic or psychological reasons The advent of pressure symptoms thyrotoxicosis or neoplastic change calls for surgical treatment

Drug induced goitre (para aminosalicylic acid sulphonamides resorcin by local application) disappears when the offending drug is excluded

Hyperthyroidism Exophthalmic Goitre

The acutely thyrotoxic patient should have complete rest in bed in a cool quiet and well ventilated room. Mental serenity and freedom from everyday vexations are best ensured by treatment in hospital The tendency to excitability should be subdued by administration of phenobarbitone gr 1 3 daily or an evening dose of a suitable hypnotic e g chloral hydrate gr 10 butobarbitone gr 1½ 3 may be added for obstinate insomnia

Thyrotoxic subjects are often undernourished and a high calorie diet is desirable A negative calcium and iron balance

is common, and may be corrected by calcium salts vitamin D concentrates and an acceptable iron preparation

Infective foci have an aggravating influence and likely sources of sepsis should be investigated Small foci such as dental abscess or maxillary sinusitis may receive treatment but more ambitious projects like dental clearance or tonsillectomy must be deferred until the thyrotoxic condition has been dealt with Similarly complications such as auricular fibrillation and diabetes are given temporary treatment as adequate control is *impossible until the thyroid overactivity* has been restrained

Antithyroid drugs The thiourea group reduce thyroid activity by inhibiting the synthesis of thyroxine Thiouracil will usually bring the metabolic rate to normal within a few weeks but the goitre is likely to remain or enlarge and exophthalmos is but slowly relieved or increased These unpleasant possibilities are unlikely if thyroid extract gr 2-4 daily is given simultaneously Dosage is in the region of 100-150 mg thrice daily until the basal metabolic rate has regained normal level The intake is then reduced to 50-100 mg daily With all antithyroid medication a minimal maintenance dose may be necessary over months or years Pulse and weight records should be kept and the optimum dose is that on which the pulse rate is maintained at 70-80 and normal weight regained If the initial dosage is unnecessarily prolonged myxœdema and thyroid hypertrophy mediated by the anterior pituitary thyrotrophic hormone will result Relapse or recurrence is an indication for increase in dosage or retreatment Thrombocyte and leucocyte counts are necessary at regular intervals as these drugs are potentially toxic and neutropenia may develop suddenly despite regular hæmatological control Medication should be discontinued immediately if the leucocyte count falls below 3 000 per cu mm or if fever sore mouth or throat vomiting or skin rash appear *Patients should be warned to report such symptoms* immediately Toxic jaundice is a rare complication

Methylthiouracil is active in slightly smaller dosage cheaper and generally less toxic than thiouracil *6-n* propyl thiouracil is still less toxic and effective in smaller amounts (initial dosage 150-300 mg daily maintenance 50-75 mg)

Carbimazole (Neo-Merca ole Schering) is the least toxic and most active and dependable of all antithyroid presently available Initial dosage is 15-45 mg (3 9 tablets) daily for two to three weeks according to severity of symptoms Subsequently reduction can usually be made to 10-20 mg. daily until the thyrotoxic manifestations have come under control maintenance therapy lies in the 2 5 15 mg region

Psychotics require a long pre operative routine as do thyrotoxic cases complicated by pregnancy Operation may safely be done in the first four months of pregnancy but carbimazole is the method of choice for patients seeking treatment at a later stage The drug should however be replaced by iodine during the last month of pregnancy otherwise fœtal goitre may occur

Surgical treatment In expert hands subtotal thyroidectomy gives excellent results with a mortality of under 1 per cent In the antithyroid drugs the surgeon has valuable allies in the shape of substances which will act with certainty as pre operative metabolic stabilisers by their aid almost every desperate surgical risk case can be converted to a normal risk

Pre-operative treatment For all but the mildest cases the routine of rest liberal diet and two to four weeks carbimazole therapy is initiated not necessarily in hospital When the metabolic rate has fallen to n rmal this is replaced by Lugol s iodine 10 drops in milk thrice daily or potassium iodide gr 5 thrice daily for ten days The abnormal vascularity of antithyroid treated goitres increases the t chnical difficulties of the operation but interval treatment with iodine over comes this objection

Thyrotoxic crises. May present in severe cases or (rarely) complicate the immediate post-operative stage Unrecog nised the mortality is high Various types have been described but there is no sharp d stinction Hyperpyrexia vomiting and diarrhœa emaciation insomnia delirium and confusional psychos s ending in apathy and coma are common Prompt treatment is important Hyperpyrexia is m t by removing the bed-covers and applying a damp sheet on which a fan plays Hibernation by ice packs or cooling coils is bett r For

vomiting and diarrhœa mouth feeding is suspended in favour of intravenous glucose salines with blood or plasma if required and salts as necessary to maintain electrolyte balance Cardiovascular manifestations (auricular fibrillation or flutter paroxysmal tachycardia) require appropriate remedies Agitative psychoses are controllable by hydrotherapy and hibernation cocktail (chlorpromazine 25 mg promezathine 10 mg and phenobarbitone gr 1) three or four times daily General therapy of the thyrocritical state includes high caloric intake liberal vitamin supplements ample fluids and Aqueous Solution of Iodine B P 2 ml in 560 ml 5 per cent glucose intravenously six hourly oxygen inhalations to combat cerebral hypoxia and cortisone 100-200 mg orally or hydrocortisone 100 mg intravenously Antithyroid drugs are too slow in action to affect the immediate crisis but the outlook is improved by large dosage (carbimazole 100 mg and 30 mg six hourly for twenty four hours then 30 60 mg daily until thyrotoxicosis is controlled) Aqueous Solution of Iodine is usually given also (0 5 1 ml in milk six hourly for forty-eight hours)

Surgery With efficient preliminary medical treatment surgery gives a quick and æsthetically satisfactory cure with small operative mortality and relapse rates although tetany and laryngeal paresis are occasional complications Antithyroid agents are not so uniformly effective in male subjects and are markedly inferior to surgery against secondary thyrotoxicosis Surgery lessens the risk of future thyroid neoplasm and is the treatment of choice in retrosternal goitre where further thyroid enlargement might prove fatal

Radiotherapy Deep therapy is now little used except in cases considered unsuitable for other measures Radioactive iodine (^{131}I) yields excellent results in diffuse hyperplastic toxic goitres but its action is slower and less predictable in toxic adenoma It is probably the treatment of choice for recurrent thyrotoxicosis after surgery Some workers confine radioiodine therapy to patients over the age of fifty on account of the possible risks of carcinogenesis renal and gonadal damage Ordinary iodine and antithyroid drugs must be omitted for six weeks before embarking on this treatment The average dose necessary to induce remission is 0 05-0 15

mc per G of thyroid tissue The gland weight is estimated clinically the average figure is about 56 G and large glands weigh about 150 G Dosage depends on gland size rather than degree of toxicity and is usually in the region of 6-10 mc orally If necessary a further half-dose is given after four months a third is rarely required The risks associated with this method of treatment are hypothyroidism and glandular carcinoma (speculative)

Exophthalmic Ophthalmoplegia

A troublesome complication of thyrotoxicosis charac terised by exophthalmos (often masked) thickening and œdema of the eyelids chemosis and extra-ocular paralyses It may arise in a hyperthyroid subject rendered euthyroid by one or other of the measures outlined above and may present in an aggravated form in patients who have only slight thyrotoxicosis The condition is caused by excessive production of pituitary thyrotrophin Thyroidectomy normal antithyroid medication and radioiodine will produce rapid worsening of the eye signs especially if the metabolic rate is lowered rapidly Thyroid extract in large dosage inhibits thyrotrophic activity and shows a mild diuretic action also this should be reinforced by salt and water restriction and acetazolamide Cortisone or delta-cortisone has been used with success in cases of rapid onset (pred nisone 20-40 mg orally daily for two weeks) The eyes should be protected from dust and wind by glasses and the patient should sleep with the head elevated Chemosis causing conjunctival herniation and corneal ulceration are indica tions for lid suture Threatened visual loss is met by orbital decompression Irradiation of the post-orbital regions has been recommended

Hypothyroidism Myxœdema

Undue susceptibility to cold is common and the patient should be warmed up and kept warm. Thyroid extract is an invaluable remedy but it must be continued for the re mainder of the patient s life The optimum dose is ascertained by experiment and it is wise to begin with gr 1 daily and increase by gr ½ at monthly intervals. Dosage exceeding

gr 3 is rarely necessary A gradual increase in the pulse rate to normal with steady fall in body weight and increase in mental and physical responsiveness are to be aimed at Large initial dosage may be dangerous and elderly subjects and those with cardiovascular lesions should be kept on sub optimal intake until the myocardial reaction can be ascertained Thyroid rapidly increases the demand on the myxœdematous heart but improvement in myocardial nutrition comes more tardily Over zealous therapy may thus precipitate myocardial infarction

Synthetic *l* thyroxine sodium is of uniform potency and may be substituted for thyroid extract 0 1 mg of the former is equivalent to gr 1 of the latter

Anæmia may be hypochromic megalocytic or macrocytic in type The first responds to iron the second to liver or vitamin B_{12} and the last responds (slowly) to thyroid extract Eventually all types tend to become responsive only to thyroid

L-triiodothyronine (Tertroxin Glaxo) is the form in which thyroid hormone acts in the tissues Its position in *therapy of hypothyroidism is not yet settled but it seems to* be valuable in treatment of two severe hypothyroid states—myxœdema madness and myxœdema coma In the former dosage of this very active agent up to 0 1 mg (equalling gr 5 of dried thyroid) daily has been suggested The obstinate hypothermia associated with coma calls for gradual warming up of the body intravenous glucose salines liberal dosage with delta-cortisone to correct *adrenal cortical hypofunction* and triiodothyronine (to a total of 0 2 mg)

Hashimoto s struma These patients tend to become myxœdematous particularly after surgery Thyroid extract *gr 3 5 daily is the best remedy and should be continued for* many months if required Radiation of large goitres is sometimes necessary as well but operative measures should be conservative and to relieve compression

Cretinism

Endemic cretinism is found in goitrous areas but the disease occurs sporadically It may go unrecognised during the first eighteen months of life As early and adequate

treatment is essential for complete mental and physical development the practitioner should form a mental picture of the infant cretin rather than of the full blown child cretin in whom the mental response rarely parallels the physical response to thyroid treatment Hypothyroidism may be suspected in infants of two months and upwards who show pallor with dryness and inelasticity of the skin. They are often unusually placid somnolent and constipated and may be lazy feeders The abdomen becomes distended and umbilical hernia is frequent

Substitution therapy must be given for the remainder of the patient's life The initial dose of thyroid extract should be pushed to toxic levels and then reduced slightly but increased in proportion to growth (two to four months gr ⅛ four to eight months gr ¼ eight to twelve months gr ½ two years gr ¾–1½ four to twelve years gr 1–3) Individual dosage varies according to tolerance and progress but it should always be just below the toxic level

Childhood myxœdema May arise as a sequel to infectious or other illness in a subject whose thyroid is hypoplastic Supplementary thyroid therapy is required and over a smaller range of dosage than in cretinism. Commencing dose should be gr ½ daily and increased gradually Loss of weight and return of vivacity and energy are indicative of adequate treatment Normal skeletal development (assessed radiologically) is a useful objective criterion

PARATHYROID GLANDS

Tetany

Caused by hypofunction or removal of the parathyroid glands Some disturbance of calcium metabolism is always present and usually a diminution of serum calcium.

Tetany following removal of a parathyroid adenoma may be relieved by intravenous injection of 10–20 ml. of 20 per cent calcium gluconate solution intravenously A diet low in phosphorus, with calcium lactate 20 G daily by mouth will enable the patient to become tolerant of his parathyroid deficiency

Cachexia strumipriva Follows extirpation of the parathyroids and its manifestations may be severe Immediate signs of hypocalcæmia are abolished by the administration of 20 ml of 20 per cent calcium gluconate solution slowly into a vein This may require repetition in three hours Parathormone quickly become ineffective Continuation treatment consists of calcium gluconate 8 G thrice daily with vitamin D 25 000-100 000 units daily or A T 10 2 5 ml weekly or twice weekly by mouth Serum calcium estimations are necessary during the first weeks of treatment later Sulkowich s test for urinary calcium will provide convenient control of calcium balance The intake of foodstuffs rich in phosphorus should in theory be reduced but as milk is a good source of calcium also little is gained by excluding it In practice dietetic restriction is omitted and a positive calcium balance maintained by continuing with calcium gluconate (or lactate) in dosage of 20 G daily together with calciferol or A T 10 Calcium absorption can be improved by giving 2-4 drachms of dilute hydrochloric acid or gr 90 of ammonium chloride daily Phosphate absorption is depressed by liberal dosage with aluminium hydroxide (Aluminium Hydroxide Tablets B P C 6-12 daily)

If the condition arises after thyroidectomy the patient may be hypothyroid as well in which case thyroid medication will lessen both deficiencies Parathyroid grafts have proved successful

Tetany associated with alkalosis may be provoked by overdosage with alkalis by prolonged vomiting or overbreathing Tetany may complicate the crises of Addison s disease and hypokalæmia Treatment must be directed primarily to the cause and the symptoms can be relieved by administration of calcium and ammonium chloride In cases due to persistent vomiting resort must be had to intravenous calcium (gluconate 20 ml of 20 per cent solution chloride 20 ml of 5 per cent solution) followed by normal saline to redress the plasma electrolyte balance

Tetany due to vitamin D deficiency occurs in rickets and cœliac disease In the former condition tetany may be precipitated by the inauguration of vitamin D therapy Spasmophilic manifestations are met by intravenous injection of

5 10 ml cal ium gluconate solution followed by mouth dosage with calcium chloride gr 40-60 daily for several days When the tetanic signs have abated a vitamin D concentrate should be prescribed in dosage of 8 000-12 000 units daily together with a general antirachitic routine Dihydrotachys terol (A T 10 Bayer) produces marked increase in calcium absorption and phosphorus excretion It may be used in dosage of up to 3 ml daily orally in place of calciferol in tetanic states other than those complicating rickets it is not antirachitic

Hyperparathyroidism

Generalised fibrocystic osteitis is usually due to the activity of a parathyroid adenoma Serum calcium and urinary calcium are increased serum phosphorus is reduced and the serum alkaline phosphatase increased Urinary calculi are frequent Surgical exploration of the parathyroids is in dica ed Unf rtunately the adenoma may be difficult to locate on account of its small size or situation in a media stinal parathyroid rest Simple hyperplasia accounts for some cases of hyperparathyroidism and rel ef follows removal of two or three parathyroids The pre-operative routine includes a d et poor in calcium and phosphorus with liberal fluid intake to protect the kidneys Intractable tetany may follow operation as available cal ium is sucked into the softened bones Cal iferol and A T 10 are not effective liberal intravenous calcium is required for several weeks (100-200 ml of 10 per cent cal ium gluconate in 5 per cent glucose by slow drip daily)

Hyperparathyroidism may complicate chronic renal disease with acid sis in which case the serum calcium is generally low or normal Treatment consists of a citric acid sodium citrate mixture to overcome the acidosis plus calcium gluconate and calciferol (15 G and 50 000 units daily)

PITUITARY GLAND

Posterior lobe deficiency Diabetes insipidus arises from defective functioning of this organ but the relationship is a complex one in which the an erior lobe infund bulum

and the tuber cinereum play a part The condition may follow injury or inflammation involving the base of the brain tumours involving the third ventricle or lesions of the hypothalamus The presence of syphilis should be excluded

The disease is in itself harmless apart from the discomfort *incidental to polydipsia and polyuria* Treatment is by administration of pituitary antidiuretic *hormone* and *is not* successful in every case Posterior pituitary extract may be snuffed in powder form (40 mg thrice daily or 0 25-0 5 ml of pitressin sprayed intranasally from an atomiser) but injection is as a rule more effective Pitressin tannate in oil (1 ml = 5 *pressor units) may be given into a muscle at intervals of two* to four days Dose 0 4-1 ml Overdosage with antidiuretic hormone will lead to water intoxication Cases due to intra cranial compression should receive appropriate surgical treatment

Anterior lobe Gigantism and acromegaly are due to *eosinophil adenoma (usually benign) of the anterior pituitary* and oversecretion of growth hormone The former condition is found in children while the latter arises after puberty Cushing reported the beneficial effect of radiotherapy in gigantism Extirpation of an eosinophil adenoma is possible in some cases of acromegaly in others radiotherapy may be *given trial Rapidly growing tumours causing loss of vision* are unsuitable for radiation and surgery is preferable Œstrogens in large dosage (combined with testosterone in male adults) may retard the osseous overgrowth Hyper thyroidism diabetes and post operative hypopituitarism should have appropriate *treatment*

Chromophobe adenomata give rise to no specific effects They cause pressure atrophy of adjacent chromophil cells and the patient ultimately develops panhypopituitarism Surgical removal is best Basophil adenomata are responsible for the appearance of Cushing s disease *a similar syndrome may originate from* an adrenal cortical tumour Surgical removal is rarely feasible but radiotherapy may be helpful

Anterior pituitary hypofunction Gives rise to various types of infantilism If the deficiency is congenital *a state of*

pituitary dwarfism occurs arising in later childhood after infectious diseases or intracranial compression e g from chromophobe adenoma the Loraine Levi syndrome results (gonadal hypoplasia with dwarfism)

Growth hormone preparations are ineffective in man but administration of androgens at puberty usually induces growth and epiphyseal union with virility and muscular development In females the same régime is applicable with small doses of stilbœstrol Thyroid and cortisone should not be used in the absence of specific indication Alternating courses of œstrogen and progesterone are useful during the post pubertal phase in females

Simmonds disease Due to infarction and atrophy of the anterior pituitary consequent on severe illness such as post partum hæmorrhage sepsis or pressure from a parapituitary tumour Vascular occlusion and tumours account for over 90 per cent of cases

Those originating from intracranial compression require surgical relief Mild examples following obstetrical shock may improve or recover with the pituitary hyperplasia in identical to a subsequent normal gestation Pituitary hormones have in the main proved useless but many cases show satisfactory response to replacement of the secondary deficiencies—gonadal thyroid and adrenal Thyroid extract gr 1 daily should be given only to cases already on cortisone otherwise Addisonian crisis may be precipitated. Cortisone is of great utility and should be given in dosage of 15-40 mg orally daily slowly reduced to a permanent basal intake of 5-15 mg. Prednisone and prednisolone are equally useful in about one fifth of this dosage Testosterone should be given to both sexes—as methyl testosterone 10 mg. sublingually daily or as subcutaneous implants of testosterone (females two or three pellets of 75 mg. males twice this amount) Hirsutism is an advantage in men but in women it must be avoided by careful dosage Intercurrent infections may lead to coma and should have prompt treatment including increased cortisone Anæsthetics hypnotics and insulin are potentially dangerous.

Fröhlich s syndrome The main features are dwarfism and obesity with lack of sexual maturation It is commonly

caused by pressure of a craniopharyngioma and improvement follows operative relief Gonadotrophic hormone and thyroid extract may be tried but many cases in this group improve spontaneously

Hypopituitary coma Induced by physical or mental strain *infection and other acute illness* The patient may show hypoglycæmia hyponatræmia hypotension and hypothermia water intoxication is frequent Treatment is firstly directed to the *precipitating cause and intravenous hydro* cortisone is of great assistance in all cases both in prevention and cure (hydrocortisone) 50-200 mg by vein repeated as necessary) Intravenous glucose is generally valuable also saline to combat overhydration Hypothermia responds to warming *methods (hot bath or hot air bath) Thyroxine* and DCA are indicated in some cases

ADRENAL GLANDS

Cushing s syndrome *May originate from a neoplasm of the* pituitary basophil element (Cushing s disease) or from a simple or malignant tumour of the adrenal cortex (Cushing s syndrome) One case in three shows adrenal hyperplasia but degenerative pituitary change not infrequently accompanies adrenal tumour Cushing s syndrome with isolated adrenal abnormality is rare in males

Whatever the morbid anatomy *clinical characteristics are* predominantly those of overproduction of adrenal corticosteroids They include metabolic disturbances such as obesity hypertension diabetes and osteoporosis Muscular weakness and atrophy striæ distensæ acne hirsutie hypokalæmia and *hypochloræmic acidosis are common* Sexual and skeletal development are often precocious in children and females develop on heterosexual lines *i e* male muscle and hair distribution enlarged clitoris Adult females tend to acquire male characteristics and amenorrhœa whereas males may *become feminised* with gynæcomastia and impotence

Treatment depends on the findings Adrenal exploration is indicated in cases of *extra pituitary origin although the* tumour may be elusive or of an infiltrating type which makes removal difficult Sprague recommends that if a tumour is

found in the gland first explored it should be removed If the gland is atrophic the tumour is probably in the other adrenal If the gland appears normal 90 per cent is removed and the other gland explored if this is normal or hypertrophied it should be removed Adrenal exploration may be done in two stages if the patient s condition so requires Since the function of the contralateral gland is depressed by an adrenal tumour severe deficiency will arise post-operatively This is countered by administration of cortisone intramuscularly 200 mg. daily by divided dosage on the three pre-operative days Post-operative dosage is on average 100 mg. intramuscularly daily for three to four days and then gradually reduced A maintenance dose of cortisone or deltacortisone orally is necessary in some cases Post operative acidosis and hypopotassæmia are treated by oral potassium chloride 2 3 G thrice daily

Congenital or acquired adrenocortical hyperplasia causes virilism Arising before the fourth month of fœtal life pseudohermaphroditism occurs in females and macrogenitosomia præcox in males Arising later hirsutism and clitoral hypertrophy occur The 17 ketosteroid excretion is much increased Cortisone orally or intramuscularly relieves the condition by inhibiting secretion of corticotrophin

Aldosterone An adrenal cortical steroid identified by S A Simpson and colleagues (1952) It has since been crystallised and synthesised It is 50-100 times as potent as DCA in controlling renal sodium and potassium loss In Addison s disease the aldosterone elaborating cells perish but are intact in hypopituitary states J W Conn (1955) described the syndrome of primary aldosteronism due to adrenal tumour consisting of increased urinary output of the steroid hypokalæmia nephropathy hypertension tetany muscular weakness and periodic paralysis (including cases formerly diagnosed as potassium-losing nephritis) These are cured by removal of the adrenal tumour Other cases presumably secondary show sodium retention ascites and œdema.

Adrenal cortical deficiency The acute form is known as the Waterhouse-Friderichsen syndrome It occasionally results from adrenal infarction or injury but more commonly follows adrenal hæmorrhage in fulminating infections such

as meningitis and pneumonia Clinically it presents as an intense shock state with extensive purpuric rash and cyanosis. *Anti shock measures should be instituted (maintain body* warmth raise foot of bed set up plasma transfusion) Morphine should not be used Give *l* noradrenaline in glucose saline drip intravenously or better hydrocortisone 100-150 mg in glucose saline 500 ml over three to four hours or hydrocortisone hemisuccinate (Ef Cortelan Glaxo) 100 mg in 2 ml water slowly intravenously In infective cases *prompt and effective antibiotic therapy is essential*

Addison s disease Due to bilateral destructive lesions of the adrenal cortex Some cases are caused by fibrosis following tuberculous infection simple atrophy accounts for many Sodium and water are lost while potassium is retained

Treatment is directed to increasing the sodium content of the tissues and substituting for the deficient hormone *Sodium chloride in dosage of 2 5 G daily will improve the* patient s condition and lessen his hormonal replacement requirement especially if no DCA is given Its irritant effect on the gastric mucosa can be minimised by using 1 G enteric coated tablets or by distributing the salt in suitable foods and fruit drinks A diet of the *high protein high calorie type* is suitable Carbohydrate snacks prevent hypoglycæmic incidents.

Replacement by cortisone or its analogues is essential therapy in Addison s disease Maintenance requirements vary wid ly but a start may be made with cortisone 15 50 mg (prednisone or prednisolone 3 10 mg) orally daily by *divided dosage Although inadequate alone* a background of DCA (desoxycorticosterone) seems to make some patients feel and do better It is preferably given as pellets of fused crystals implanted into the subcutaneous fat of the abdominal wall (75 150 mg) This remains active for six to eight months *The trimethylacetate suspension intramus*cularly is active for one month (dose 30-60 mg) During any p riod of special st ess the allowance of cortison must be increased dur ng inter urrent illn ss of infective nature th increase must be three or four fold and adequate antibiotic therapy given as well Otherwise the patient is liable to go into Addisonian crisis

The criteria of successful regulation of Addison s disease are gain in weight appetite and energy elevation of blood pressure and restitution of normal sodium, potassium glucose and urea levels in the blood The patient should remain in bed until a satisfactory gain in weight and energy materialise and he should be protected from cold Vomiting and diarrhœa are met by temporary restriction of diet fluids alkalis sedatives and astringents may help Purgatives are forbidden Search should be made for tuberculous foci particularly in the chest and genito-urinary system Over dosage with cortisone or DCA will cause hyperchloræmia azotæmia generalised œdema and consequent cardiac embarrassment.

Addisonian crisis Absolute rest in bed is necessary with prompt treatment of any coincident infection Intravenous saline (5 per cent) with glucose must be given by drip infusion Hydrocortisone 100-150 mg should be added to the drip or Ef-Cortelan Glaxo 100 mg dissolved in 2 10 ml of saline and given slowly intravenously These may be repeated as necessary at eight hourly intervals until mouth dosage becomes effective Cortisone acetate 100 mg into a muscle and repeated in half dosage every eight hours is very useful intermediate therapy in severe cases Further saline and fluid infusion should be controlled by laboratory data to avoid overhydration unresponsive shock and hypotension call for the addition of *l* noradrenaline 4 mg per litre of saline Once the patient is able to resume feeding, the routine described for Addison s disease should be put in train

Phæochromocytomata Tumours arising from chromaffin cells of the adrenal medulla which induce hypertension by virtue of their adrenaline or noradrenaline content They may be multiple and are sometimes located in aberrant medullary tissue The hypertension may be paroxysmal with symptoms of hyperadrenalism *i.e* giddiness palapitation headache dyspnœa and syncope or sustained

Removal of the tumour is curative handling causes a dramatic hypertensive response and post-operative hypotension is equally dangerous For the acute hypertension phentolamine (Rogitin Ciba) is added to a saline intravenous drip in amounts of 5 mg. as required when the

diastolic pressure exceeds 140 mm. Serious fall in blood pressure is likely after ligature of the veins and a 0 001 per cent solution of noradrenaline is administered by intravenous drip in amounts sufficient to maintain blood pressure at 100-110 mm If the fall in blood pressure does not occur a second tumour is present

ACTH and Cortisone Therapy

Hans Selye regarded the adaptation mechanism as pro tective against stress and its action is mediated by the pituitary which in turn stimulates satellite endocrines The pituitary adrenal axis has come to be viewed as a stress adaptation safeguard It is noteworthy that certain types of treatment such as artificial pyrexia protein shock and insulin shock were employed empirically in conditions now con sidered to be stress manifestations and these methods probably act by inciting the stress adaptation mechanism

The adrenal is a complex organ from which more than twenty five crystalline steroids have been isolated Selye s thesis has received substantial confirmation from results of investigation with pituitary adrenocorticotrophic hormone which stimulates endogenous production of adrenocorti costeroids

Until a few years ago the potential range of usefulness of corticotrophin and the corticosteroids was unforeseen and they seemed destined for minor therapeutic rôles as replace ment agents in endocrine disorders Hench and Kendall showed that rheumatoid arthritis and some allied non endocrine disorders were temporarily suppressed Early clinical trials were mostly with the collagen diseases and favourable results were noted in rheumatoid arthritis rheumatic fever osteoarthritis disseminated lupus erythe matosus and periarteritis nodosa That the effect was not a group specific one was proved by the response obtained in other widely dissimilar conditions and it became clear that these hormones could modify many metabolic processes

The background of Selye s work suggested trial of the hormones in acute emergencies of the alarm variety and the gratifying results in status asthmaticus acute gout burns shock hæmolytic and hæmorrhagic crises allergy and drug

intoxications accentuated the importance of the pituitary adrenal axis as mainspring of the body defence mechanism.

The rationale of the hormones is still unknown but it may be said that the action is (unless used as a replacement agent) non-specific and temporary tissue reactions towards nocuous environment are altered and when used in self limiting affections they inhibit pathological reactions while morbid activity persists Thus in diseases the activity of which is terminated by fibrous tissue reaction the baneful effects of fibrosis in the cardiac valves for example may be mitigated or prevented Pulmonary tuberculosis peptic ulcer and surgical wound healing may theoretically be adversely affected but it is now clear that in many serious infections like typhoid and miliary tuberculosis the corticosteroids can hold up the tissue reactions and allow effective antibiotic actions to take place In viral hepatitis and obstinate obstructive jaundice prednisolone and neomycin together have proved beneficial

In crises such as burns and overwhelming infections where the adrenal cortical function is in eclipse corticotrophin may exert a true replacement effect That the hormones act at cell level is apparent from results of their application to the eye nose and synovia

Adrenocorticotrophic hormone (corticotrophin ACTH) Extracted from anterior pituitary glands On injection it stimulates the adrenocortical mechanism, which elaborates in particular the 11 hydroxysteroids It is inactivated by the gastro-intestinal enzymes and the eosinopenic response is a gauge of its activity The hormone is usually given intramuscularly but slow intravenous injection shows a much more prolonged effect The overall effect (in proportional dosage) is much the same as with cortisone provided that the adrenals are able to respond Cortisone or a related steroid is obviously preferable in some conditions oral activity is a convenience, and certain undesirable side effects (salt and water retention vasospasm and hypokalaemia) are less prominent than with ACTH

Cortisone (11-dehydro-17 hydroxycorticosterone compound E) Prepared by partial synthesis from bile acids, or more economically from hecogenin (sisal) Available as pure

hormone but the micro-crystalline acetate suspension is of equal potency (25 and 50 mg per ml) Where a relatively rapid effect is required e g in Addisonian crisis or operative treatment of Cushing s syndrome oral dosage is 50-250 mg daily by divided fractions the upper range being used for rapid control of acute manifestations after which gradual reduction to maintenance level should be effected dosage by intramuscular injection is 100-200 mg daily in six hourly fractions reduced to 40-60 mg according to progress

Hydrocortisone (17 hydroxycorticosterone compound F) Originally obtained by perfusion of an 11 17-corticosteroid (compound S) through the adrenal gland but now prepared synthetically believed to be the naturally circulating form of cortisone The pure hormone and its acetate show marked difference in potency the former being 50 per cent more active than cortisone and the latter much less active than either possibly because of its lower solubility The acetate is used for injection into joints and dermal application A continuous intravenous infusion of hydrocortisone or its hemisuccinate sodium (100-150 mg) may be life saving in acute adrenal failure to bridge the latent period of intra muscular cortisone or oral prednisone

Deltasteroids Prednisone and prednisolone are analogues of cortisone and hydrocortisone respectively They possess similar anti inflammatory and anti rheumatic effects but these compounds are five times more active with similar side-effects although the deltasteroids cause less sodium and water retention This latter property makes them preferable in nephrotic and cardio-cirrhotic states and possibly less useful in Addison s disease Peptic ulcer may be reactivated and a history of this condition is usually a contra indication The fear that surgical incisions will not heal is largely without foundation. Dosage is one fifth of corisone Triamcinolone an α fluoro derivative of prednisolone (Ledercort Lederle Adcortyl Squibb) is reputed more active with less tendency to induce œdema hypertension potassium depletion etc Dosage is on average one third less than that of pred nisolone Medrone Upjohn a methyl derivative has similar potency

Prolonged therapy The adrenals may become functionally

inhibited and atrophic with prolonged cortisone or delta cortisone therapy ACTH may cause adrenal hyperplasia and histological signs of regression in the anterior pituitary There is no evidence that Addison s or Cushing s syndromes have resulted from treatm nt This endocrine impairment is reversible after cessation of therapy but in the induced negative adrenal phase the body is asthenic and vulnerable to stresses such as infection and trauma including surgery Additional hormone dosage will be necessary if su h stresses compli ate trea ment

Complications Result from hormonal excess and with careful dosage are usually of minor importance They are more frequent in women and children than in men

Changes in fat metabolism Increased fat storage Cushing configuration moon face and buffalo hump on the back of the neck The calorie intake should be controlled during treatment

Changes in carbohydrate metabolism Diabetogenic effect with liberal dosage If the patient had a normal glucose toleran e previously the condi ion usually subsides on cessation of therapy Progressive severity of established diabetes has not been noted Prevention is by control of carbohydrate intake

Changes in protein metabolism growth and wound healing Large doses lead to increased urinary nitrogen ex retion and negative balance Interference with wound healing seems to be of experimental rather than clinical significance High protein diet testosterone and potassium have been suggested for prevention of these eff cts

Changes in electrolyte balan e Sodium and water retention diminished perspiration loss and increased potassium excretion (more marked with ACTH on account of the increased DCA production under its stimulus) Muscular weakness low blood pressure and low voltage electrocardiograms are indications of potassium lack Hypertension may be temporary and due to plethora a more severe form is caused by adrenergic stimulation and is a contra indication to further therapy These side effects are dangerous in the presence of myocardial disease or nephritis. For prevention sodium-poor diet and diuretics potassium by mouth

Skeletal changes Increased excretion of calcium and phosphate leads to osseous demineralisation and fractures as in Cushing s syndrome Elderly arthritics are osteoporotic in any case

Blood changes Disappearance of circulating eosinophils three to four days after commencement of therapy (more marked with ACTH)

Androgenic effects Masculinisation facial hirsuties amenorrhœa (women) acne striæ distensæ reduced 17 ketosteroids (both sexes) Dosage should be as low as possible in women and children, especially in brunettes with sallow complexions

Psychiatric changes Usually euphoria sometimes in somnia depression or confusional psychoses Probably pre-existing mental instability uncovered by treatment which should cease

The following conditions may show favourable response to corticosteroids

Collagen group

rheumatoid arthritis polyarteritis nodosa
osteoarthritis (symptomatic improvement)
rheumatic fever disseminated lupus erythematosus
sarcoidosis dermatomyositis
scleroderma temporal arteritis

Allergic states

bronchial asthma and hay fever
drug sensitisation angioneurotic œdema
Loeffler s syndrome

Blood diseases

hæmorrhagic conditions Henoch Schonlein purpura
acute leukæmia acquired hæmolytic anæmia

Metabolic diseases

acute gout

Endocrine disorders

Addison s disease Waterhouse Friderichsen syndrome
Simmonds s disease Following adrenalectomy for inoperable carcinoma
Adrenocortical hyperplasia congenital and acquired

Eye diseases (local application of hydrocortisone)

iritis uveitis choroiditis	interstitial keratitis
Stevens Johnson syndrome	sympathetic ophthalmia

Skin diseases

acute dermatitis	pruritus ani et vulvæ
exfoliative dermatitis	pemphigus

Various

ulcerative colitis (cortisone orally hydrocortisone locally)
nephrotic syndrome emphysema and pulmonary fibrosis
toxic jaundice

Contra indications

Cushing's syndrome	hirsuties
diabetes	renal and cardiac disease
hypertension	psychiatric instability

Relative Contra indications

active or quiescent tuberculo is	active infections
active or quiescent peptic ulcer	

THE GONADS

Eunuchoidism Results from pre pubertal testicular hypofunction deficiency arising after puberty causes obesity with genital atrophy and loss of libido

Replacement therapy in the form of testosterone is sometimes of considerable value and the propionate is given intramuscularly in dosage of 25 mg for an adult once to thrice weekly until improvement occurs For maintenance therapy methyl testosterone 50-100 mg daily by mouth or sublingually (5 mg tablets) is worthy of trial. Implantation of either preparation in pellet form is a convenient and successful method, 500 mg implant corresponds to 4 mg sublingually daily There is no valid basis for the use of androgenic steroids in impotence and the male climacteric. Testosterone has been used in combination with chorionic gonadotrophin for cryptorchidism in otherwise normal pubescent subjects Delayed testicular descent in generally undeveloped boys may be treated first with chorionic gonadotrophin e g Pregnyl Organon 200-500 i u

intramuscularly twice weekly to correct the primary hormonal deficiency later spermatogenesis is stimulated by administration of testosterone 5 25 mg intramuscularly twice or thrice weekly There is considerable doubt as to the efficacy of this treatment and it is always possible that spontaneous testicular descent will occur at puberty In boys who are mentally and otherwise physically well developed surgical treatment is preferable especially in view of the hazards associated with inguinal retention

Ovarian hypofunction May be primary due to defective ovarian development or secondary to deficient pituitary or thyroid activity Cases in the first group should have treatment by stilbœstrol 1 2 5 mg daily orally in ten day courses commencing at puberty provided growth is complete prior medication with methylandrostenediol (Protandren Ciba) 25 mg sublingually daily will improve short stature and is less likely than other androgens to induce virilisation For the secondary group in which general hypoplasia of the genital organs is common serum gonadotrophic hormone and thyroid extract should be given (see p 171) The gonadotrophic hormone e g Gestyl Organon may be administered in dosage of 1 000 i u weekly by intramuscular injection

Ovarian granulosa cell tumours Cause precocious development with tendency to skeletal overgrowth and the tumour may be large enough to produce abdominal protuberance Retrogression of the abnormal sexual development follows removal of the tumour

Metropathia hæmorrhagica Irregular uterine bleeding occurs most frequently in adolescent girls and as a menopausal phenomenon Before embarking on hormonal therapy a pelvic examination is essential particularly in the menopausal group in order to exclude malignancy Treatment may be by luteinising hormone or androgens (Gonadyl Chorionic Roussel) 1 000 i u being given intramuscularly daily until bleeding ceases to prevent recurrence six similar doses may be given on alternate days before the next period Progesterone is given intramuscularly in 20-40 mg doses daily for four to six days and the series is repeated after an interval of two weeks Several courses of this order may be

needed Testosterone antagonises œstrin production and encourages the endometrial resting phase dosage 100 mg. intramuscularly daily for four doses Androstalone 25 mg sublingually for six days at the onset of bleeding is little virilising and therefore preferable Suppression of the catamenia for several months may follow testosterone therapy but undesirable side-effects such as hirsutism are liable to occur

Amenorrhœa and oligomenorrhœa May be due to physical stress emotion to constitutional conditions such as malnutrition anæmia tuberculosis or to local causes Œstrogen treatment is successful in cases showing no gross hypoplasia or other developmental defect Ethinyl œstradiol, a synthetic derivative of œstradiol is a useful oral preparation (0·05-0·15 mg) daily in twenty day courses with ten day rest intervals Serum and chorionic gonadotrophins are also of assistance and may be used in dosage of 1 000 i u. by muscle on five successive days followed by 300 i u for three days. Anæmia should be corrected by dosage with iron

When evidence of the establishment of a menstrual cycle is forthcoming a synthetic œstrogen should be given daily between the seventh and twenty first days Progesterone is then substituted (10-25 mg. daily) for four days and withdrawal bleeding may occur three to five days afterwards Amenorone Roussel is a useful combination which contains ethisterone 50 mg and ethinyl-œstradiol 0 05 mg. (4 tablets) (4 tablets daily on the twenty first to twenty fifth days of the cycle) Several courses are usually required to establish a firm cycle which may subsequently be maintained by œstrogens alone

Menopause Unpleasant symptoms such as flushing palpitation and nervousness are diminished by minimal dosage with œstrogens Ethinyl œstradiol is well tolerated, and may be taken in dosage of 0·01-0·05 mg. daily for periods of ten to fourteen days Suitable intake is found by experiment but should stop short of provoking uterine bleeding. Natural œstrone or stilbœstrol is more effective against flushing and is given as 0·1 mg. tablets, 4-12 daily until the symptom is controlled when the patient should revert to diminished intermittent dosage

Combinations of œstrogens and androgens are sometimes preferable to œstrogens alone as androgens minimise the tendency to breast turgidity and uterine bleeding (Pausandryl Roussel Mixogen Organon 1-4 tablets daily for ten to twelve days followed by fourteen days rest) Hypothyroidism if present should be corrected Atrophic vaginitis and kraurosis vulvæ are improved by local and general œstrogen therapy

Stein Leventhal syndrome A Cushing like condition in young women characterised by obesity amenorrhœa sterility facial hirsuties and acneiform eruptions associated with fibrotic and polycystic ovaries Hormonal treatment is useless but wedge resection of the ovaries restores menstruation and fertility in most cases

CHAPTER XI

DISEASES OF THE BLOOD

Hypochromic Anæmias

From the therapeutic viewpoint this group may be made to include the common *microcytic* anæmia, Plummer Vinson syndrome, chronic anæmia due to hæmorrhage and the hypochromic anæmias of infancy and childhood. Possible ætiological factors are deficient intake, absorption or utilisation of iron and excessive demand in menstrual disorders and pregnancy. The presence of contributory factors such as peptic ulcer, sepsis, tuberculosis and neoplasm must be excluded.

In cases where the anæmia is mild or moderate (hæmoglobin 60 per cent or over) confinement to bed is unnecessary, but strenuous exertion should be avoided. If the hæmoglobin is under this figure, rest in bed is desirable until substantial improvement in the hæmatological condition occurs.

Fresh air and sunlight are valuable therapeutic aids, and release from unhealthy working conditions is desirable. Dental sepsis or deficiency should be remedied. Treatment may be nullified by excessive menstrual loss, and gynæcological assistance must be sought. Hæmorrhoids, if bleeding, call for hæmostatic measures short of radical operation.

A nourishing dietary containing ample protein is essential. Iron must be given orally in adequate dosage until the blood picture becomes satisfactory; afterwards maintenance therapy for one week in each month may be sufficient. The following preparations are suitable for routine use:

Ferric Ammonium Citrate Mixture, B.P.C., ½ fl. oz. four times daily.

Ferrous Gluconate Tablets, B.P., 6-12 daily.

Lacquered Ferrous Sulphate Tablets, B.P. (or as Fersolate, Glaxo), 4-8 daily.

Enteric coated tablets or capsules are sometimes preferable on account of their freedom from gastric irritation but dysphagic patients swallow liquid preparations more easily For the occasional patient who is genuinely intolerant of inorganic iron salts a colloidal suspension of the metal may be substituted (*Colliron* Evans *Idozan* Coates & Cooper Dose 4 12 drachms daily) Ferrous succinate preparations are well tolerated and utilised *e g* Elixir Ferromyn and Ferromyn Tablets (Calmic) Chelates cause little alimentary upset Ferroids, Riker (iron aminoates) 3 8 tablets daily Sytron P D (sodium ironedate) 6 drachms daily

Imferon Benger is a stable iron-dextran preparation for intramuscular injection which is very useful for initial treatment of severe or refractory hypochromic anæmia particularly where oral therapy is ill tolerated or the body reserves of iron are depleted Two ml of the solution (100 mg elemental iron) will raise the hæmoglobin level by about 2 5 per cent so that a subject weighing 140 lb with a hæmoglobin level of 50 per cent would require (allowing for replenishment of iron stores) 8 daily injections of 5 ml The daily dose for children is 1 2 ml and for thin or elderly subjects 2 ml

Constipation is not aggravated by vigorous iron therapy routine purgation should be avoided as it interferes with absorption of the metal Increase of the fruit and vegetable content of the diet and small doses of liquid paraffin will encourage bowel regularity Dyspepsia may require temporary alleviation by alkalis and sedatives but in achlorhydric cases the administration of dilute hydrochloric acid with meals may improve digestion

Convalescence should be lengthy otherwise relapse may occur A restful holiday in the country or at the seaside is most beneficial Confirmed iron deficient anæmic females should have regular courses of therapy

Post hæmorrhagic anæmia Complete rest in bed is necessary with control of the bleeding source if possible A sedative such as morphine will allay anxiety If the hæmoglobin level falls to 40 per cent blood transfusion should be arranged for If the blood loss has been sudden the first 2 pints of blood may be given rapidly (fifteen to twenty

minutes) and afterwards a slow drip is used Full iron dosage (preferably intramuscularly) is instituted as soon as the patient's condition permits In severe hæmorrhage other anti shock measures must be employed Moderate warmth should be secured and fluid-electrolyte balance corrected if necessary by intravenous infusion

Dextran is of limited utility as a blood replacement but is rapidly gaining favour as an anti shock measure

The foot of the bed should be raised and in desperate cases bandaging the limbs tightly will help Inhalation of oxygen in high concentration is indicated in cases of severe oligæmic shock and it may keep the patient alive until blood transfusion can be set up Stimulants such as caffeine nikethamide and pholedrine are rarely of utility Methylamphetamine hydrochloride in dosage of 30 mg. intravenously will help to maintain blood pressure but it should not be used until the blood volume has been partially restored Careful record of the general state pulse rate and blood pressure readings affords the best indication as to adequacy of treatment Hæmoglobin readings do not reflect the true state of affairs during the immediate post hæmorrhagic phase

Addisonian Anæmia Pernicious Anæmia

The pathogenesis of this disease has not been fully elucidated The fundamental defect appears to be failure of absorption of vitamin B_{12} (extrinsic factor) in the upper alimentary tract, due to lack of intrinsic factor present in normal gastric juice Replacement therapy can be effected by a variety of substances *e g* experimentally by normal gastric contents fæcal extracts The first practical therapy was the administration of raw or lightly cooked mammalian liver pulp in amounts of ½ lb daily (Minot and Murphy) A later refinement was the use of liver extract or desiccated hog's stomach by mouth (Liquid Extract of Liver B P 1 oz. daily Desiccated Stomach ½ 1 oz. daily)

Various combinations of iron, liver folic acid and vitamins are available commercially but they should not be depended upon for treatment of Addisonian anæmia Oral preparations are variable in activity and become unpalatable under

prolonged usage they should be used only in exceptional circumstances

The first element of treatment in this disease should be accurate diagnosis Examination of the peripheral blood and bone marrow must be done before therapy begins otherwise the diagnostic criteria quickly become confused The expectant treatment of anæmia with buckshot preparations *of liver and iron is a real disservice to the patient*

Intramuscular injection of a potent liver extract was until a few years ago the sheet anchor of treatment Ana hæmin B D H and Examen Glaxo are two of many excellent preparations which are used in doses of 2 ml daily for the first week During the second week the liver extract may be injected on alternate days when a satisfactory hæmatological response ensues the intervals are gradually lengthened until a maintenance dosage is arrived at (usually *2 3 ml fortnightly)*

Vitamin B_{12} (cyanocobalamin) Cobalt-containing pigments isolated from liver extracts proved active in remission of pernicious anæmia in amounts as small as 1 μg It is produced commercially as a by product of streptomycin manufacture by fermentation of *Streptomyces griseus* This substance occurs widely in Nature and has been recovered from fæces of normal and pernicious anæmia subjects Cyanocobalamin is a true vitamin being concerned in growth of animals and *probably of children also*

Vitamin B_{12} has so far proved the most popular effective and economical treatment for Addisonian anæmia although some workers have encountered a tendency for the hæmato logical remission to become incomplete within two years Oral dosage is effective Distivit Distillers Co is a coba lamin peptide complex initial dosage 3 10 μg tablets daily for 10 days Then 1 daily for 1 2 months followed by 10-50 μg daily indefinitely

Initial dosage is in the region of 50-100 μg by intramus cular injection daily for four or five days after which the frequency may be reduced to twice weekly In severe cases elderly subjects and those with concomitant infection or neurological complications 1 000 μg should be given daily for seven days When the blood count reaches normal

dosage may be gradually reduced to a basal level of 50-100 μg fortnightly on this most patients will maintain improvement indefinitely Subacute combined degeneration of the cord is an indication for trebling or quadrupling the dosage of cobalamin at all stages of therapy

Folic acid (pteroyl / glutamic acid) Certain members of the vitamin B complex exhibit hæmopoietic properties in pernicious anæmia Of these folic acid 5 methyluracil the *L. casei* factor and the citrovorum factor (which is probably folinic acid) are active in macrocytic anæmias The dose of folic a id is 20 mg daily by mouth and this may subsequently be reduced to 10 mg daily It should not be used in Addisonian anæmia as it is ineffective for prevention or relief of *post ro-lateral sclerosis It is however often superior to* liver or vitamin B in the macrocytic anæmias associated with sprue cœliac disease steatorrhœa and pregnancy

General management. Includes rest varied and nourishing diet (containing liberal protein) fresh air and sunshine If the hæmoglobin is under 60 per cent rest in bed is indicated in order to lessen myocardial strain and hasten recovery Septic foci should have circumspect treatment but extensive procedures such as dental clearance must be postponed If the hæmoglobin level is under 70 per cent and rapid response is desirable transfusion of packed cells will produce gratifying improvement in the patient s condition. Oral or intramuscular iron is a useful temporary medication for patients with an initially low blood count and showing rapid response to anti anæmic therapy

Response to treatment. Judged by improvement in the patient s colour strength and energy After a few days anti anæmic treatment the reticulocyte count will rise from a basic figure of about 3 per cent to a critical level of 20-30 per cent which after the tenth day will diminish as the erythrocyte count increases A steady rise in hæmoglobin and erythrocytes should begin after about seven days treatment Disappearance of erythroblasts from the peripheral blood, also of the characteristic megaloblastic bone marrow reaction and the reappearance of normal serum bilirubin values indicate satisfactory response Basic maintenance requirements

vary between individuals and in the same individual over a period regular blood counts should be done to ensure that anti anæmic dosage is adequate

Cheilitis and glossitis Tend to improve under adequate therapy Vitamin B concentrates (particularly nicotinamide and riboflavine) and ascorbic acid may be tried

Diarrhœa Relieved by dilute hydrochloric acid 45 90 minims and glycerin of pepsin 60 minims in water with meals

Subacute combined degeneration and peripheral neuritis The latter responds well and the former improves slowly with massive liver or vitamin B_{12} therapy Three or four times the usual dosage should be given Unnecessary confinement to bed is avoided The patient should be warmly clad and encouraged to take exercise (in the open air if possible) in order to stimulate the peripheral circulation Massage and re educational exercises improve muscle tone and help the sufferer to regain confidence in his lower limbs

Gastric carcinoma Develops in a significant proportion of pernicious anæmia subjects and should be sought for if unwonted dyspeptic symptoms make their appearance

Other macrocytic anæmias May arise from interruption of hæmopoiesis at various stages Dietetic deficiency anæmia is due to lack of extrinsic factor or protein substrate The tropical macrocytic anæmia described by Lucy Wills is believed to belong to this category These respond to adequate protein intake Marmite or yeast folic acid or liver extract Another variety is caused by surgical interference with the gastrointestinal tract Total gastrectomy and gastro enterostomy may lead to sequelæ of this kind Treatment is as for pernicious anæmia Defective absorption of anti anæmic liver principle may occur in sprue steatorrhœa intestinal obstruction and fistulation Folic acid is effective in cases due to sprue etc. but vitamin B_{12} is indicated where surgical lesions exist Defective hepatic storage of anti anæmic principle is occasionally encountered in association with a cirrhotic liver and hepatic malfunction may also be operative in macrocytic anæmia of pregnancy Treatment as

for pernicious anæmia Achrestic anæm a of Wilkinson and Israëls may be due to defective utilisation of antianæmic principle by the bone marrow but many are steatorrhœic. Treatment is not as a rule curative but blood transfusion and folic acid are temporary expedients Macrocytic anæmia due to bone marrow invasion by tumour cells is little responsive to treatment. For myxœdema anæmias see p 154

HÆMOLYTIC ANÆMIAS

These are broadly classified into those due to congenital abnormalities of the erythrocyte and the acquired types due to extra-corpuscular causes *e g* toxic.

Acholuric Jaundice

The characteristics of the congenital type are jaundice anæmia and splenomegaly Spherocytosis increased fragility of the erythrocytes increased serum bilirubin and urobilin excretion are constantly present Pigment and calcium gall stones are found *in* 60 per cent of cases and leg ulceration is a frequent compl cation During a crisis the patient becomes febrile increasingly icteric and splenomegalic gall-stone colic may be a complication. The acquired type shows similar tendencies but these cases are possibly mild enough to have escaped recognition during childhood. Icterus and increased erythrocyte fragility may be slight anæmia being the leading feature

Treatment. A sheltered life is best. Exposure to cold and strenuous exertion should be avoided Splenectomy is a very effective resource The gall bladder should be explored, and if s ones are present the viscus is removed. Pre and post operative blood transfusion is required although overload (with its risk of portal thr mbosis) must be prevented. If possible operative treatment should be avoided during a crisis or when the platelet count is high it is however in severe crises that splenectomy may be life-saving The post operative thrombocyte increase may induce venous thrombosis this should be forestalled by heparin or coumarin therapy at the earliest sign of hæmoconcentration

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Erythræmia Polycythæmia Vera

The general routine is that for arterial hypertension and includes a quiet life with limited activity The diet should be designed to exclude articles rich in iron such as red meats eggs liver thick meaty soups and green vegetables Considerable symptomatic relief follows venesection (500-1 000 ml) done in under thirty minutes and repeated one to five times yearly to keep the packed cell volume around 55 per cent

Nitrogen mustards have an inhibitory action on bone marrow Triethylenemelamine (TEM) 5 mg orally weekly is the most popular cytotoxic agent Radiotherapy to the long bones and thoracic cage has a slow and somewhat irregular depressant action on the bone marrow

Radioactive phosphorus induces longer and more satisfactory remissions than the earlier methods of treatment ^{32}P is best given intravenously in dosage of 2 5 5 mc In older patients where the possibility of arterial or venous thromboses arises one or more venesections should be done (shortly before or after administration of ^{3} P) to reduce the red cell count to near normal The reticulocyte count will drop to normal about two weeks after an adequate dose and the erythrocyte count should approach normal in six to eight weeks If no significant fall results a second dose may be given in about three months Remissions last six to eighteen months although some of three years have been reported

Erythrocytosis Secondary Polycythæmia

Causal conditions such as congenital cardiac lesions pulmonary disease and hæmoconcentration must be taken into account in deciding treatment Chronic poisoning as by carbon monoxide phosphorus or arsenic requires appropriate action

Enterogenous Cyanosis and Methæmoglobinæmia

Parhæmoglobinæmia may be caused by the ingestion of sulphonamides nitrites potassium chlorate acetanilide phenacetin and phenazone Constipation with excessive formation of hydrogen sulphide in the bowel may be a factor

also intestinal infection with the nitrite producing organ isms and consumption of well water contaminated by nitrates

Treatment consists of omission of the responsible drug and correction of con tipation by liquid paraffin and enemata

Methæmoglobinæmia including the familial form can be relieved by intravenous injection of methylene blue (7 10 ml of 1 per cent solution) Ascorbi acid is a more convenient long term therapy 200-400 mg daily orally will control the methæmoglobinæmia and cyanosis probably by acting as a sub titute for the missing intra-erythrocytic r duc ng system Chemical revers on of sulphæmoglobin is impossible

Lymphadenoma Hod,kin s Disease

A stimulant régime including good food fresh air sunshine and tonics of iron and arsenic should be exploited For severe anæmia blood transfusions are given Radiotherapy is a useful palliati e particularly in early cases and those where enlarged lymph nodes threaten to compress important structures *e g* mediastinum and spine In cases of slow development where there is strict loca ..ation in peripheral lymph nodes surgical extirpation of the entire regional lymphat c chain may be done as a preliminary to intensive radiotherapy

Alkylamines are the most effective therapy for disseminated lymphadenopathy with severe constitutional disturbance Remissions are sometimes dramati but not so prolon,ed as after radiotherapy The nitrogen mustards are effective but triethyl nemelam ne (T E.M) has the advantage of being active by mouth Several courses of 15 mg over two weeks may be given with intervals of six to eight weeks, as required und r strict hæmatological control Chlorambucil (Leukeran B W) is a mustard d rivative with few unpleasant side-effects Dose—0 2 m, /kg body weight orally daily for four to six weeks It should not be used within four weeks of substantial radio- or chemotherapy Retrogression of the lymphatic masses and of the splenomegaly occurs, tog ther with improvement in the general condi ion

Cases of long standing—particularly those with thoracic and abdominal lesions, in whom radiotherapy has been ful y

exploited—often reach an impasse characterised by anæmia pyrexia and cachexia where they tend to be radio-resistant If such patients are treated by preliminary transfusions alkylamine therapy may initiate improvement in the general state and restore radio sensitivity

The Leukæmias

Acute leukæmia may be myeloblastic lymphoblastic or rarely monoblastic Severe hypochromic anæmia calls for repeated blood transfusion and antibiotics are useful for control of sepsis Stomatitis and buccal ulcers improve with use of a *citric acid mouth wash (½ 1 fl oz of saturated* solution in a tumblerful of water)

6-Mercaptopurine (*Purinethol B W*) an antimetabolite of purine bases of nucleic acid exerts an inhibitory action on the blast cells and is useful in actue leukæmia as *well as the blastic terminal stages of chronic leukæmia* Average daily dose 2 5 mg /kg body weight orally for six to twenty six months as necessary Double dosage may be required initially and maintenance may be as low as 1 mg /kg Regular blood counts must be done The steroid *hormones are useful adjuvants to aminopterin or mercapto*purine cortisone 100 mg daily or prednisone 25 mg daily

Chronic leukæmia is commonly myeloid or lymphoid, and may run a course of months or years during which time fair health is possible Such patients should lead sheltered lives *and all possible measures are taken to improve nutrition and* resistance Intercurrent infections must be combated by appropriate antibiotic therapy Hypochromic anæmia is a constant finding which calls for iron and occasionally for blood transfusion

Antimetabolite drugs are of little value when the cells are dividing slowly as in the chronic leukæmias Drugs which act as cell poisons are more effective particularly in the myeloid variety

Urethane (ethylcarbamate) by mouth in dosage of 3 5 G *daily to a total of 80-170 G* has been tried in leukæmia and myelomatosis This drug is more effective in chronic myeloid than in lymphatic leukæmia and in favourable cases it will produce temporary correction of the blood picture similar

to that obtained by radiotherapy Nausea with gastric disturbance is an objection but this may be avoided by use of the rectal route

The nitrogen mustards have a variable and often disappointing effect in chronic leukæmia Mustine hydrochloride (2 2-dichlorodiethylmethylamine) is given by slow daily or alternate daily intravenous injection of 5 mg (or less according to body weight) for six doses If necessary this course may be repeated after 4 to 6 weeks

Karnofsky introduced triethylenemelamine (tretamine TEM) as a treatment of the Hodgkin s-leukæmia group Its action is similar to that of the nitrogen mustards but it can be given orally in enteric-coated tablets Dosage is 2 5 10 mg. daily one hour before breakfast for two doses This routine is repeated after a week provided that the white cell count is satisfactory The maximum effect is noted in two to three weeks, and further treatment is decided by the patient s blood count and general condition. Side effects are nausea and vomiting Busulphan (Myleran B W) is effective only in chronic myeloid leukæmias The dose is 4-6 mg orally daily for as long as improvement is shown usually four to sixteen weeks As the granulocyte count falls the dose if reduced and omitted when the level of 15 000 is reached This substance may be tried in cases judged unsuitable for radiotherapy and in those who have become radio-resistant

Radiotherapy X ray treatment remains the most generally applicable and efficacious measure it will often defer invalidism and prolong life A series of treatments to the splenic area bones and affected lymph nodes will produce a satisfactory fall in the leucocyte count diminution in spleen size and a tendency to normalisation of the differential white cell distribution ^{32}P 4 9 mc. orally according to cell count and more important still the clinical state appears to have no advantage beyond a saving of time in treatment and lessened liability to radiation sickness

Chronic lymphocytic leukæmia when active responds best to TEM or chlorambucil, although mustine is occasionally more effective in alternate daily intravenous dosage of 5 mg (or less according to body weight) for six doses If necessary this course may be repeated after six to ten weeks.

Irradiation of the spleen and gland masses and ^{32}P are occasionally useful in alternation with cytotoxic therapy while cortisone and related steroids are useful adjuncts

Agranulocytosis Neutropenia

The characteristic features of these conditions are serious reduction or absence of polymorphonuclear leucocytes from the blood and absence of myeloid reaction Fever anæmia and ulcerative or gangrenous lesions of the mouth and pharynx are common concomitants A similar syndrome may terminate leukæmia and myelophthisic anæmias Agranulocytic angina may occur without obvious cause or follow the administration of certain drugs such as barbiturates amidopyrine chloramphenicol troxidone PAS phenyl butazone sulphonamides organic arsenicals gold and thiouracil The mechanism of sensitisation is not understood but is probably of the nature of an anti white cell agglutinin

Treatment consists in withdrawal of the offending drug if still in use cure usually follows in seven to twenty-eight days Rest in bed is necessary until a satisfactory marrow reaction occurs Liberal diet fresh air iron and vitamin concentrates especially of B and C are useful Oral sepsis usually responds to citric acid mouth washes and antibiotics Septicæmia accounts for most fatalities in neutropenia and appropriate antibiotics in heavy dosage are the most important item of treatment Penicillin should be given (2 5 mega units daily) until recovery is complete or until laboratory data suggest substitution of a more effective antibiotic BAL should be used in cases presumably due to poisoning by arsenic gold or mercury (1 5 ml of 10 per cent oily solution deeply intramuscularly four hourly for two days then twice daily for six days) Blood transfusion is a useful standby in the presence of anæmia and fresh blood should be used if *thrombocytopenia* and hæmorrhagic features are present (the leucocyte replacement factor is negligible) Pentose nucleotide members of the vitamin B series iron folic acid and liver extracts are valueless Cortisone and related steroids in large doses are useful in accelerating clearance of the offending antibody

HÆMORRHAGIC STATES

Purpura

There are three main groups—those showing deficiency of essential factors such as prothrombin those showing platelet deficiency and those with increased capillary permeability

Infections e g meningococcal give rise to purpuric eruptions and the drug group includes arsenicals gold sulphonamides phenobarbitone and coumarins Other causal factors are allergic states exposure to x radiation vitamin C deprivation renal hepatic and blood diseases malignancy and senility Idiopathic cases have a chronic course with remissions which tend to become more prolonged after adult life is reached The purpuric trait although dormant may be reactivated by pregnancy stress etc.

Purpuric rashes rarely require treatment but hæmorrhage from mucous surfaces may be troublesome If accessible clots should be removed and pressure dressings soaked in fresh 1 10 000 solution of Russell s viper venom (Stypven B W) applied. Control of infection in bleeding sites or hæmatomata by suitable antibiotics and replenishment of depleted iron stores are necessary For extensive purpuric affection rest in bed and transfusion of freshly drawn whole blood is indicated Steroid hormones should be given to tide the patient over an acute hæmorrhagic crisis (cortisone 25-50 mg six hourly orally hydrocortisone 100 mg by vein twelve hourly reducing the dosage as soon as feasible) Splenectomy is of value for resistant cases

Idiopathic thrombocytopenic purpura is characterised by diminution in the platelet count, prolonged bleeding time and positive capillary resistance tests Immediate benefit often follows splenectomy but the operation should if possible be postponed to a quiescent interval Transfusion (fresh blood) is usually necessary before and after surgical intervention Re-establishment of a normal thrombocyte count may be expected within seven to ten days of operation.

ACTH cortisone and deltasteroids have been shown to stimulate thrombocyte production in some cases of Werlhof s disease and these hormones increase capillary

resistance thus lessening the hæmorrhagic tendency in all purpuric states By their use in conjunction with blood transfusion desperately ill children may be conditioned sufficiently to undergo splenectomy

Hæmophilia

The patient should beware of trauma and surgical manœuvres are to be discouraged unless essential and undertaken in hospital Intramuscular and subcutaneous injections are best avoided Blood transfusion is required in hæmophilic crises for restoration of antihæmophilic factor freshly drawn blood is desirable but in emergency stored blood or plasma (preferably fresh) will serve After the first sizeable transfusion small amounts (50-100 ml) of blood or plasma at four or six hourly intervals are sufficient to keep the coagulation time at under fifteen minutes thus averting further hæmorrhage if severe bleeding has led to anæmia full replacement with fresh blood is necessary Antihæmophilic globulin is likewise temporarily effective Unfortunately patients who have had frequent treatment courses tend to become refractory to blood plasma and antihæmophilic globulin Antihæmophilic globulin of animal origin may be used to cover emergencies like abdominal operations but this measure is not repeatable

Effusions of blood into the connective tissues should be left alone Joint aspiration may be necessary to preserve joint function and should be done with strict asepsis after adequate replacement of AHG Hæmarthrosis is met by immobilisation and bandaging orthopædic treatment may be desirable later Local hæmostasis is secured by the application of pressure dressings soaked in thrombin solution Fibrin foam is also effective

Routine dental care is essential and caries should be arrested as promptly as possible Extraction becomes imperative sooner or later and should be done in hospital with preliminary transfusion

CHAPTER XII

DISEASES OF THE KIDNEYS

Acute Glomerulonephritis

Rest in bed is essential and should be prolonged until urinary output and concentrating power are regained As a rule four to six weeks rest is sufficient and if recovery be delayed beyond this period the probability of chronic renal damage arises Hæmaturia usually clears up quickly albuminuria and cylindruria are more persistent but bed rest need *not* be indefinitely prolonged on account of their presence The patient must be protected from chill and draught and a long sleeved woollen bed jacket provided there is then no necessity to nurse him between blankets

With regard to diet the initial allowance should be 1½ pints of sweetened fruit drink daily with bread, biscuits honey and preserves after a week one pint of milk may be added During the stage of oliguria excessive fluid intake does no good but encourages œdema When renal permeability returns nothing is gained by starving the patient of food or fluid The increase in fluid allowable is proportionate to the improvement in renal output but if œdema is pronounced these figures should be made to correspond Later the diet may be enlarged to include porridge cereals bread toast and biscuits butter jam and honey milk puddings jellies vegetables and fruit Adequate vitamin intake should be ensured from the outset *Improvement* in the renal condition as evidenced by disappearance of casts and blood from the urine restoration of normal blood urea level and satisfactory renal concentration tests is an indication for addition of protein to the diet notwithstanding the presence of albuminuria. One helping of egg meat or fish may be given daily and increased according to progress Salt is best omitted and highly cellular foods such as butchers offals are undesirable

The urine should be kept alkaline to litmus by fruit juices citrates and bicarbonates *provided that oliguria and* potassium retention are absent

Iron deficiency anæmia is common in nephritis and will retard recovery unless actively treated Purgatives and diaphoretics should be withheld as they merely increase the patient s discomfort Daily bowel action may be secured by the use of magnesia and liquid paraffin

Convalescence should be tardy and physical activities regained slowly The patient should be warned against chills damp clothing and footwear and he must guard as far as possible against infections of the upper respiratory tract *Septic foci are dealt with during a quiescent phase and* surgical interference can often be made less provocative of nephritic activity by the use of penicillin or other anti biotic

Œdema may be a distressing complication of acute neph ritis A water balance chart should be kept and the intake adjusted to correspond with output until diuresis appears Persistent oliguria should be met by institution of the dietetic measures described under Anuria Attempts at initiating diuresis by hypertonic venoclysis are dangerous and in effectual Convulsions may occur particularly in children *and are due to cerebral œdema and angiospasm* Lumbar puncture with removal of 10 30 ml of cerebrospinal fluid is a useful procedure If unsuccessful recourse must be made to venesection (10-20 oz.) followed by a dose of pentobar bitone by vein Oral sedation may be desirable for a day or two until the convulsive tendency has waned Hypertonic solutions are justifiable only in resistant cases 25 100 ml of 50 per cent glucose by vein is least harmful

Congestive cardiac failure may make a sudden appearance and is productive of severe discomfort The best treatment is morphine gr [illegible] intravenously venesection and oxygen *inhalation* Digitalis is rarely of as istance

Acute Hæmorrhagic Nephritis

Common in childhood and frequently follows acute infec tions *The condition is not clearly demarcated from acute* glomerulonephritis but is usually benign and carries a good

prognosis although this cannot be guaranteed in any given case Massive but transient hæmaturia with albuminuria and cylindruria are common features Hypertension with cerebral symptoms occurs in a proportion of cases Treatment is on the lines indicated for acute glomerulonephritis

Subacute and Chronic Glomerulonephritis
Nephrotic Types

May follow an attack of acute nephritis although in some instances no such incident can be identified There is great variation in the clinical findings within this group but heavy albuminuria with blood and casts in the urine is common and hypochromic anæmia is usually a feature There is a tendency to salt retention this with protein loss in the urine and anæmia encourages the onset of œdema Nitrogen excretion is usually normal

These patients do better in a mild equable climate A quiet regular life should be enjoined and suitable outdoor exercise allowed during clement weather Strenuous physical exertion exposure to damp and cold and indulgence in alcohol are harmful Coincident infections should be treated and reasonable precautions advised against respiratory and intestinal infections

A diet rich in protein is beneficial by this means the urinary output is increased and the loss of protein compensated for 120-150 G daily is a fair allowance but is subject to adjustment in accordance with appetite If there is evidence of lipid retention the fat content should be low but carbohydrate may be liberal

If œdema is present rest in bed and a low sodium diet should be ordered (less than 0 5 G daily) which will usually be more effective in controlling œdema than fluid restriction For patients showing hæmoglobin deficiency iron is a valuable remedy Careful watch must be kept on the electrolyte balance as these patients readily acquire a sodium potassium lack

Diuretics are sometimes of service in nephrotic cases and urea is traditional but nauseating dose gr 100-200 daily in orange juice and water The mercurial diuretics are often satisfactory if nitrogen retention is absent, but their irritant

effect on the already damaged kidney structure precludes their use in some cases Mersalyl 1 2 ml may be given intra muscularly at intervals of four days after the effect of a preliminary dose of 0 5 ml has been observed A better response may be obtained from two injections at an interval of twenty four hours followed by a week s rest Ammonium chloride gr 10-20 should be given four times daily by mouth so as to overlap the period of mersalyl administration Oral diuretics are effective and much less toxic than mercurials They may be used to implement the latter and in cases no longer responsive to mersalyl in moderate anasarca they are often sufficient alone *Chlorothiazide Saluric Merck* Sharp & Dohme causes marked increase in the renal output of chloride and sodium The usual dose is 2-4 0 5 G tablets on four consecutive days weekly Chlorothiazide is practically non toxic and 10 tablets may be given on the first day Potassium loss may be considerable and supplements may be necessary Amisometradine Rolicton Searle also increases sodium excretion and chloride in equimolecular amounts Dose 0 4 G tablets 4 on the first day and 2 daily thereafter Cation exchange resins have been used orally and rectally to control œdema by increasing sodium elimination by the bowel Their effect is variable but they are helpful in some cases Acute infections should receive energetic treatment

Blood transfusion will provide a valuable stimulus to recuperation in anæmic and dropsical subjects and concentrated plasma (two to five fold) may be used as a means of restoring the serum osmotic tension and inducing diuresis Intravenous dextran infusions have also been tried Their use appears to be free from untoward reaction but unfortunately the effect is as ephemeral as that of blood and plasma

Purgatives should not be given as a routine magnesium *hydroxide* sulphate or cascara are safe for occasional use Effusions into serous cavities should be aspirated but mechanical drainage of the lower limbs avoided if possible

Cortisone and ACTH cause fluid retention followed by a *withdrawal diuresis ACTH (15 60 mg six hourly intra* muscularly for twelve days and repeated as necessary) has

given better results than the corticosteroids although the recently introduced methylprednisolone may prove of value in nephrosis In nephrotic children temporary improvement has followed therapeutic malaria thyroid and nitrogen mustard but these methods do not appear to have any scientific basis

Chronic Glomerulonephritis with Vascular Degeneration

There is no rigid demarcation of this group from the one considered above and intermediate stages are frequently found Typically water and salt retention are absent but azotæmia with cardiovascular degeneration and hypertension are common Progressive failure of renal function is inevitable and treatment is purely symptomatic Moderate restriction of protein intake is theoretically desirable but starvation diets merely add to the patient s misery Normal carbohydrate intake may be allowed In view of the tendency to acidosis which arises in the later stages the acid ash value of meat and starch should be compensated by increasing the fruit and vegetable allowance and by citrates

Uræmia. A frequent termination of chronic nephritis and in these circumstances treatment is wholly disappointing Diet should be reduced to semisolids and liquids, and liberal fluid intake by mouth is desirable Alkali in the form of sodium bicarbonate is given in doses of 2 drachms hourly until the urine becomes alkaline in order to combat acidosis Nausea hiccough vomiting and diarrhœa are serious and intractable symptoms and indications for intravenous administration of 4 G of sodium bicarbonate in 500 ml of physiological saline or 10-20 per cent glucose In chronic uræmia intravenous fluids must be used with caution on account of the risk of pulmonary œdema Chlorpromazine (Largactil M & B) 25 mg by vein or muscle is good symptomatic treatment

Headache restlessness and convulsions are due to electrolyte imbalance and the case should be investigated along these lines Acidosis if present should be corrected. Hyperkalæmia commonly complicates renal failure Venesection (10-20 oz.) and withdrawal of cerebrospinal fluid by lumbar puncture may be tried If the convulsions are not arrested by

these measures recourse may be had to intravenous injection of hypertonic glucose solution Hypocalcæmia is present in some cases of chronic nephritic uræmia here the sedative effect of calcium salts by the intravenous route may be exploited Insomnia is often troublesome and calls for the use of hypnotics Phenobarbitone should be tried in the first instance but morphine may be necessary later

Myocardial failure is met by digitalis morphine and inhalations of oxygen Renal asthma is compounded of acidosis and circulatory failure Alkalinisation morphine and oxygen inhalations give some relief

Extrarenal uræmia Occurs in conditions of alkalosis *e g* persistent vomiting and overdosage with alkalis Urea retention with increased blood alkali reserve and the passage of *dilute alkaline urine are characteristic (In renal uræmia* acidosis is the rule) Alkaline medication should be stopped and 10 ml of 10 per cent calcium gluconate given intravenously followed by normal saline (see p 205) In cases of vomiting due to pyloric or high intestinal obstruction the possibilities of surgical relief must be explored

Anuria The obstructive type may complicate renal calculus Until the renal block has been overcome fluids should be limited to the amount necessary to relieve thirst (maximum 1 litre daily) Catheterisation of the ureter or renal pelvis may relieve calculous anuria if unsuccessful *nephrostomy* will be necessary

Anuria due to tubular necrosis may follow renal circulatory failure or poisoning as in shock states ischæmic muscle necrosis incompatible transfusion reactions mercurial and sulphonamide intoxication *The prognosis of this serious state* has been considerably improved by introduction of dietetic and artificial kidney methods By means of a high calorie non protein diet nitrogenous retention is kept at a minimum by exclusion of salts and reduction of fluid intake to that sufficient to balance extrarenal fluid loss rest to the damaged kidneys is assured

In mild cases the patient should be fed on a lactose and water diet until evidence of renal recovery is forthcoming Patients more severely ill may be treated by a Bull régime or more simply by a diet of 700 ml of 50 per cent glucose daily

through an indwelling Ryle s gastric tube But if excessive vomiting diarrhœa or intestinal ileus presents the intra gastric tube must be abandoned in favour of a caval one J W Chambers and George Smith (1957) use a No 9 F cardiac catheter inserted through the right great saphenous and right femoral veins the tip lying in the inferior vena cava just above the renal veins where rapid dilution of the infusion fluid (50 per cent glucose plus any necessary electrolyte replacement) is assured 1 000 units of heparin is added to each 500 ml of infusion fluid and the drip maintained continuously until renal function return

After an anuric period of eight to fifteen days the reformed tubular epithelium regains its diuretic function During the stage of free diuresis the tubular absorption mechanism is still defective and a similar state of affairs may arise also in chronic nephritis (Thorn s salt losing nephritis) Electrolyte depletion especially of sodium and potassium may produce a clinical picture akin to that of Addisonian crisis Electrolyte deficiency should therefore be replaced quantitatively Throughout, anæmia must be corrected by infusion of packed cells and infection combated by appropriate anti biotics (in small doses during the anuric stage)

Peritoneal and intestinal dialysis techniques are effective but require the presence of experienced personnel artificial kidney methods postulate elaborate apparatus as well. Intestinal dialysis will reduce the serum potassium level which tends to be dangerously high in prolonged anuria Resonium A orally or rectally is also effective and less troublesome

INFECTIONS OF THE URINARY TRACT

Acute Pyelitis

This is the most common manifestation of urinary in fection. General treatment consists of rest in bed warmth light diet and administration of sufficient sedative to prevent loss of sleep from urinary frequency and irritation An easy daily bowel evacuation should be secured but harsh purga tives aggravate the urinary symptoms Before embarking on

treatment a catheter specimen of urine or in males a mid stream specimen should be examined bacteriologically as a precise diagnosis is essential Liberal dosage with Potassium Citrate and Hyoscyamus Mixture B P C is excellent initial therapy

Sulphonamides These drugs give brilliant results in uncomplicated infections by sensitive organisms The soluble sulphonamides are active against *Esch coli* and its variants hæmolytic streptococci and some strains of staphylococci and enterococci Trisulphonamide Tablets B N F are popular for urinary antisepsis and preparations of the Lederkyn type (1 2 tablets daily) are good in elderly patients As sulphonamides are concentrated in the urine during excretion large do es are unnecessary provided that the fluid intake be kept within reason

Kidneys damaged by nephritis excrete sulphonamides slowly and effective urinary concentrations are difficult to attain cautious dosage is essential in such cases Their bacteriostatic action is maximal in alkaline urine and citrates or bicarbonates should be given concurrently An adult *should receive 2 trisulphonamide tablets six hourly for* four days and then thrice daily for four days For a child of six years 2 G and for an infant 1 G daily is adequate dosage Some cases relapse shortly after completion of such a course and for this reason it is often desirable to continue with the sulphonamide for a further three or four days using half dosage

A clearance test should be taken a few days after treatment has ceased The urine should be free from albumin and pus and sterile on culture

Penicillin Is effective in urinary infections caused by hæmolytic streptococci coagulase positive staphylococci and diphtheroids Urinary reaction does not affect its efficacy Dosage varies according to the pathological lesion a simple pyelitis will respond to 1 mega unit daily by muscle but cases of pyelonephritis and renal carbuncle should have double or treble dosage

Streptomycin Has an inhibitory action on the five most common Gram negative urinary invaders *Esch coli* infections are equally well controlled by sulphonamides but

streptomycin may be used as an introductory or follow up course in cases of long standing and in mixed infections e g *Esch coli* and enterococci. The urine should be kept alkaline The dose is 1 2 G daily for four days by intramuscular injection Unfortunately streptomycin resistance develops very rapidly in urinary pathogens so that this drug has only occasional indications

Tetracyclines and chloramphenicol Active against a wide range of urinary invaders and resistance is not an important factor The tetracyclines are valuable for hæmolytic staphylococcal and streptococcal infections whereas chloramphenicol would be preferred in infections with bowel organisms Polymyxin is the antibiotic of choice in Pseudomonas infections or a combination of oxytetracycline and streptomycin streptomycin and chloramphenicol is another effective combination for infections resistant to straightforward chemotherapy Erythromycin is stated to be most effective in *Str fæcalis* infections Nitrofurantoin (Furadantin Duncan Flockhart) is active against most common urinary invaders and successes have been reported in Proteus Aerobacter and some Pseudomonas strains Dose 50-100 mg. orally four times daily

The advent of efficient urinary bacteriostatics has not lessened the need for adequate surgical drainage but surgical interference has been rendered safer by their use An element of urinary stagnation is usually present in refractory or relapsing cases although reinfection occasionally occurs from an extra urinary focus such as the teeth gall-bladder or bowel. Prostatic obstruction renal calculus and developmental anomalies demand appropriate surgical treatment, otherwise medical measures are doomed to failure Relapsing urinary infection with bacterial invaders should call to mind the possibility of tuberculosis being present as well.

Pyelitis of pregnancy is sometimes obstinate on account of the element of ureteric obstruction present Sulphonamides are well tolerated Cases showing signs of ureteric obstruction such as severe renal pain rigor vomiting and fever should be nursed in the prone or left lateral position with the foot of the bed raised

Abacterial pyuria is an uncommon condition but it is disturbing because of the presumption raised that the case may be one of tuberculosis It has been regarded as a virus disease possibly associated with Reiter's syndrome The condition is self limiting and *there is no effective therapy*

Renal Tuberculosis

Found in association with tuberculosis elsewhere and the general treatment appropriate to that infection is applicable Streptomycin and the adjuvant drugs *p* amino salicylic acid isoniazid and thiosemicarbazone are *of value in all* but chronic fibrocaseous lesions of the kidneys and bladder here the foci are avascular and uninfluenced by drugs fibrosis of the ureters and bladder may even be aggravated by their use

Combined courses of streptomycin and the auxiliary medicaments in turn will clear the urine of *Myco tuberculosis* in the early stages where radiology shows no definite involvement of the kidneys For more extensive infections a combination of streptomycin 1 G intramuscularly every third day PAS 15 G daily and isoniazid 300 mg daily for six to twelve months after the urine has cleared and symptoms disappeared is desirable

Surgical treatment may be necessary to remove a small quiescent polar focus where disorganisation of one kidney or bilateral involvement exists the major focus should be removed by nephrectomy

Renal Calculus

A patient who is passing renal sand or small concretions should be instructed to increase his fluid intake to 5 or 6 pints daily Patients immobilised for long periods should by some means have their position altered frequently to avoid recumbency stones which are usually apatite (calcium phosphate) In practically all other cases of calculus the urine is acid *i e* oxalate or uric acid stone and must be kept *neutral or just alkaline to litmus by administration* of Potassium Citrate and Hyoscyamus Mixture B P C Excessive alkalinity leads to phosphatic incrustation of the

existing stone in which case urinary acidifiers such as acid sodium phosphate or ammonium chloride must be substituted Uric acid deposition is met by exclusion of purine rich foods like liver kidneys and sweetbreads and maintaining the urine alkaline The consumption of green vegetables should be encouraged Oxaluria is an indication for omission of rhubarb spinach tomatoes strawberries asparagus beetroot potatoes and chocolate

Acid and alkaline ash diets are occasionally used for prevention of recurrent stone The low phosphorus acid ash diet with urinary acidifiers may be tried in cases of calcium phosphate deposition although its use may cause mobilisation of calcium from bony structures and subsequent deposition in the urinary tract It consists of cereals bread pastry potatoes sugar peas beans beetroot and mushrooms unsalted meat fish eggs and unsalted butter Milk fruit and vegetables (except those mentioned above) are omitted The urinary pH should be maintained at 5 4 (rose pink to methyl red) Aluminium carbonate or hydroxide orally encourages fæcal diversion of phosphate

The alkaline ash diet with citrates is used for uric acid or urate deposition, and consists of milk butter cheese fruits and vegetables For oxalate calculi the diet should exclude chocolate and fruits and vegetables of high oxalate content calcium intake should be low (under 1 5 G daily) Nothing is gained by altering urinary reaction

Hyperparathyroidism should be thought of in multiple or recurrent stone formers particularly with apatite or oxalate stones

Prien recommends continuous salicylate medication for prevention of recurrence in predisposed subjects.

Many small renal stones are passed spontaneously stones which give a radiological opacity less than ¼ inch in diameter should have their progress checked regularly by x rays Calculi which by reason of size or position cannot be passed spontaneously should be removed by operation provided that the patient s condition is good If the urine is infected, a preliminary chemotherapeutic course should be provided In view of the liability to further calculus formation a post-operative régime on the lines discussed above is

advisable a large urinary output is the most important factor in prevention

The surgical repertoire in nephrolithiasis is extensive For a stone which is moving radiological observation and if below the pelvic brim and under 1 cm diameter cystoscopic dilatation of the distal ureter may permit extraction of the stone if not uretero-lithotomy must be done An imprisoned renal calculus may be delivered by pelvic or parenchymal approach Partial nephrectomy may be desirable in the event of an irreversibly dilated polar calyx A staghorn stone should be fragmented and extracted but if the kidney is hopelessly damaged nephrectomy is indicated Bilateral staghorns present a very delicate problem where the scope of the surgical project must depend on renal function

Renal Colic

First essentials are rest in bed and warmth to the painful flank Immersion in a hot bath is sometimes helpful Morphine gr $\frac{1}{4}$ with atropine gr $\frac{1}{100}$ should be injected the former intravenously if necessary Pethidine 50-100 mg and methadone 10-20 mg intramuscularly or intravenously are also effective Calcium chloride (20 ml of 5 per cent solution intravenously) has been recommended in obstinate cases but some yield only to chloroform inhalation Lumbar sympathetic block affords relief for severe and protracted colic.

Further treatment is that of renal calculus

FLUID BALANCE WATER AND ELECTROLYTE DEPLETION

Water forms about 60 per cent of the human body weight It may be considered as in two main compartments (*a*) the extracellular compartment representing 20 per cent of body weight and containing blood plasma (5 per cent of body weight) and interstitial fluid including lymph (15 per cent of body weight) (*b*) the intracellular compartment (40 per cent of body weight)

The cell membranes are permeable to water which moves from one compartment to the other the motivating force being various equilibrium reactions *e g* pH osmotic pressure as a general rule tonicity takes precedence over volume Water intake is by way of swallowed liquid (1,200 ml) 1 000 ml from solid food and 300 ml from oxidation processes (preformed water from disintegration of body tissues) The main physiological losses are 1 500 ml as urine and 600 ml each by skin and lung. Selective renal filtration, mediated by hormones (mostly pituitary antidiuretic and adrenocortical) keeps the amount of retained water optimal assuming intact renal function The kidney excretes or conserves by reabsorption from the glomerular filtrate essential substances like water sodium chloride and glucose This stabilisation function is less precise in infants because the ability of the kidney to concentrate urine is limited Perspiration loss and metabolic rate are higher so that fluid imbalance can occur rapidly and in serious form

Another important factor in fluid regulation is the continuous interchange of water and electrolytes which takes place in the intestinal tract. If intestinal fluid is lost by vomiting diarrhœa continuous aspiration or fistulation, d hydration and electrolyte imbalance surely follow

The *extracellular fluid* contains a variety of ionic and non ionic substances but sodium chloride ions are of most importance in the present connection. For electro-neutrality the sum of the basic ions must equal the sum of the acidic ions and the use of the milliequivalents per litre convention instead of milligrammes per 100 ml gives a graphic representation of the respective combining powers of electrolytes in body fluids For example plasma contains 155 milliequivalents per litre each of anions and cations. Conversion is simple

Equivalent weight = weight of atom or molecule divided by valency

$$\text{mEq /litre} = \text{mg /100 ml} \times \frac{10 \text{ valence}}{\text{atomic weight}}$$

$$\text{mg /100 ml} = \text{mEq /litre} \times \frac{\text{atomic weight}}{10 \text{ valence}}$$

Ion and valence	*Atomic weight*
Na^{+}	22 997
K^{+}	30 096
Ca^{++}	40 08
Mg^{++}	24 32
Cl^{-}	35 457
HCO_3	61 018
H_2PO_4	96 996
HPO_4	95 989
SO_4 ~	96 066

By means of various buffer mechanisms the kidney is enabled to get rid of acid and alkali increments without alteration of *p*H or damage to the tissues Metabolic dis turbances which affect acid base balance often cause abnor mal water and salt loss also

The *intracellular fluid* is more complex in constitution than the extracellular and it is more difficult to fathom its changes Potassium is the main cation magnesium being next in amount The anions are phosphate sulphate and protein Cell membranes are not readily permeable to sodium and potassium nor do magnesium and phosphate by intravenous injection enter the cells freely this makes absolute measurement not truly indicative of the patient s electrolyte balance at any given time and influencing the intracellular fluid composition may be difficult and danger ous Alteration in one compartment induces compensatory changes in the other In the case of sodium depletion the serum sodium reflects only partially the extent of the loss as water from the extracellular compartment passes into the cells to maintain osmosicity Another difficulty is that according to the view of Peters cells may store base in an osmotically inactive form *e g* large molecule storage as in the case of glucose glycogen Potassium and phosphate can perhaps be similarly tucked away intracellularly

Marriott has emphasised the distinction between water depletion and sodium deficiency The former usually follows failure of intake thirst is a constant symptom followed by dry mouth oliguria the urine being of high specific gravity and normal chloride content Loss of weight increased

serum sodium and decreased potas. ium follow The volume of fluid in the extracellular compartment is maintained by transfer from the intracellular space unless water de pletion is severe This syndrome is reversible by giving water but water deprivation plus muscular exertion and hyperpnœa in a hot atmosphere can be rapidly fatal For water depletion in a conscious patient give 1 3 litres if unconscious give 2 litres of 5 per cent glucose solution or tap water by rectal drip In the post-operative state or if there is renal damage give only enough to relieve thirst

McCance induced pure salt depletion in human subjects A few days after a definite sodium deficit was incurred as shown by a fall in serum and urinary sodium with tendency to raised blood urea a syndrome appeared suggestive of Addison s disease (apathy lassitude anorexia nausea and vomiting muscular cramps) No diuresis resulted after water ingestion but the symptoms were aggravated Lowering of blood pressure with decreased cardiac output increased blood viscosity and peripheral circulatory resistance followed

Combined salt and water depletion frequently exists usually in consequence of abnormal renal or extrarenal activity In uncontrolled diabetic states glucose excretion by the kidney implies coincidental loss of salt in salt losing nephritis and lower nephron nephroses reabsorption of salt may be markedly reduced An uncorrected extrarenal loss of salt and water as in diarrhœa or continuous gastric suction gives rise to a combined depletion of the extracellular fluid which is partially compensated from intracellular fluid Symptoms are a combination of those enumerated above—apathy thirst nausea oliguria with peripheral vascular collapse A sodium deficit may exist with normal or raised serum sodium values on account of water loss by the kidney

The position may be further complicated by an abnormal acid base balance as chlorides form an important part of the buffer mechanism Estimation of urinary chlorides as by Fantus s test is m sleading as in diabetic acidosis the presence of buffer chlorides in the urine may mask a plasma chl ride deficiency Conversely patients with high plasma chloride levels may at times fail to excrete chlorides.

Normal values

Plasma sodium	137 147 mEq /litre
Plasma chloride	100-105 mEq /litre
Plasma bicarbonate	25 30 mEq /litre
	125 135

If the sum of chloride and bicarbonate values lies outside the range of 125 135 mEq /litre a sodium abnormality can be inferred In the average patient a deficit of 10 mEq /litre in plasma sodium means a total body deficit of 500 mEq or about 30 G of sodium chloride this should be replaced as 300 ml of 10 per cent sodium chloride intravenously over three hours The plasma bicarbonate figure gives information regarding the acid base position being low in acidosis and high in alkalosis the opposite applies when these arise from respiratory causes Black s rule for correction of salt deficit is

$$\frac{140 - \text{plasma sodium in mEq /litre}}{3} = \text{litres of N/1 NaCl required}$$

Potassium salts should also be given during correction of severe sodium deficit as the lack is usually threefold

Retention of water Leads to water intoxication The maximum renal diuresis is about 1 500 ml hourly When the renal arterial pressure is low as in post hæmorrhagic states this condition may easily arise Nausea and vomiting represent an attempt at physiological correction bradycardia muscular twitchings convulsions and coma are characteristic Excess of water relative to extracellular electrolyte means that water can enter the cells injection of hypertonic saline reverses this cellular invasion Clinically water to slake thirst is harmless but intravenous and even rectal administration may be dangerous The normal water requirement (by vein) is about 2 litres daily and if more liberal amounts are contemplated adequate electrolyte must be given as well In anuria in adrenal cortical deficiency and post operative states diuresis may be in abeyance and water harmful Overdosage can be corrected by intravenous injection of 50-100 ml of 5 per cent sodium chloride

solution and the use of a radiant heat cradle to promote sweating

Fluid replacement is therefore a problem individual to each patient and laboratory data (plasma specific gravity potassium sodium or chloride and bicarbonate blood urea serum albumin) will give an indication of requirements Physiological saline and glucose saline are useful up to a point beyond which solutions more adapted to the individual need must be substituted For example if the sodium deficit exceeds that of chloride M/6 sodium lactate is an appropriate solution Loss of gastric secretions should be compensated for by an acidic fluid whereas loss of bowel fluids indicates a replacement solution of basic composition

Gastric containing 17 mEq potassium 63 mEq sodium and 150 mEq /litre chlorides the deficient cations being made up with ammonium

Intestinal containing 12 mEq potassium 138 mEq sodium and 100 mEq /litre chlorides the excess of 50 mEq base being neutralised by lactate

The ammonium and lactate are rapidly metabolised and the fixed ion content of these solutions resembles closely the fluids they replace They are isotonic and may be given intravenously or subcutaneously

Respiratory acidosis (low *p*H high CO_2 combining power acid urine) can be corrected by hypotonic saline and glucose or Ringer lactate intravenously Chronic bronchitics were treated with acetazolamide (Diamox Lederle) by J Nadell (1953) to reduce serum bicarbonate levels *Metabolic acidosis* (low *p*H low CO CP acid urine) if mild yields to Ringer lactate if severe Hartmann s solution or M/6 lactate should be given Tetany may develop after treatment particularly in the presence of potassium deficiency which is relieved by Darrow s K lactate solution intramuscularly *Respiratory alkalosis* (high *p*H low CO_2 CP alkaline urine) if mild responds to intravenous Ringer solution if severe N/4 ammonium chloride by vein is effective For tetany intravenous calcium should be given *Metabolic alkalosis* (high *p*H high CO CP alkaline urine) is treated by intravenous infusion of Ringer s solution physiological saline or if severe gastric solution

Hypokalæmia An abnormality of the intracellular com partment and may exist without gross change in blood potassium levels But in episodes of periodic paralysis caused by shift of potassium into the cells the serum potassium is low although no absolute deficiency of potassium exists nor clear relationship between paralysis and potassium level This state of affairs may also present after dosage with insulin and glucose

Sources of potassium are bread meat and vegetables and restricted diets may induce hypokalæmia As potassium has priority of excretion over sodium the kidney continues to excrete it and it is depleted further by dehydration by saline infusion by the glucose diuresis of uncontrolled diabetes and by administration of adrenocortical hormones and testo sterone Loss of gastro-intestinal secretions is another im portant cause and replacement therapy which ignores potassium lack will obviously do harm A fall in intracellular potassium induces apathy muscular weakness and mental aberration—an altogether vague syndrome Extracellular deficit on the contrary is easily detected and has character istic signs muscular paralysis of the ascending type leading to respiratory difficulty and generalised mu cular weakness The electrocardiogram shows flat or inverted T segments and *depressed S T segments* The Q T interval is often prolonged but this is due to concomitant hypocalcæmia A serum potassium level of under 4 mEq /litre indicates an extra cellular deficiency a normal does not exclude an intracellular deficit Acidosis usually co-exists or alkalosis with high plasma bicarbonate levels

Treatment If the kidney function is normal give 10 15 G potassium chloride daily by mouth (a mixture of the two phosphates is more palatable) If the kidneys are damaged do age should be lower and controlled by serum potassium estimations If oral do age is impracticable give a 0 3 per cent (40 mEq /litre) solution of potas ium chloride intra venously slowly (1 litre in three hours) The intramuscular route is safer Reversal to a high voltage cardiogram is a sign of over-correction

Intravenous potassium is dangerous unless there is a free diuresis as in the oliguric state the outflow of potassium

from the cells may far exceed the capacity of the kidneys to excrete it and dangerous accumulation in the plasma will follow Glucose facilitates the passage of potassium into the tissues and saline corrects dehydration and improves the urinary flow Potassium if still required will then be safe

Hyperkalæmia May complicate Addison s disease renal failure or intravenous potassium therapy The signs are parasthesiæ flaccid paralysis and electrocardiographic stigmata (absent P segment widening of QRS and high voltage sharply peaked T segments) The danger level is 10 mEq /litre (about twice the normal figure) The most effective treatment is glucose and insulin Oral adminis tration of a sodium cation exchange resin (Resonium A Bayer Products 45-60 G daily) is also helpful.

Electrolyte balance is an important consideration in treatment of anasarca by fluid and sodium restriction mercurial diuretics and cation exchange resins Dehydration and salt loss syndrome may develop in elderly cardiac patients The blood urea level although normal at the beginning of treatment rises smartly and the plasma chloride falls giving a disturbing clinical picture of apathy somnol ence mental confusion and coma leading to death The anasarca is unresponsive or may increase Hypochloræmic alkalosis usually supervenes, as indicated by elevated plasma bicarbonate and *p*H The salt deficit should be calculated and replaced Ringer s solution is satisfactory for this purpose

In collective electrolyte therapy it should be borne in mind that biochemical tests are som times fallacious and must be interpreted in terms of clinical facts such as extent and mode of fluid loss Over-correction must be avoided the normal homeostatic capacity of the kidney will ensure fine a ljustments, once major aberrat ons have been remedied

CHAPTER XIII

DISEASES OF THE CARDIOVASCULAR SYSTEM

Pericarditis

Absolute rest in bed is essential and the patient may be propped up with pillows or bed rest if dyspnœa is severe *Diet should be restricted to fluids and bowel evacuation* secured by salines or enemata Precordial pain is a distressing feature which is met by kaolin poultices icebags or short wave diathermy Analgesics such as sodium salicylate and aspirin are indicated and full dosage is required in cases of rheumatic origin Codeine morphine and methadone are valuable remedies for severe pain restlessness and insomnia Dyspnœa and cyanosis become more pronounced with the advent of pericardial effusion and should be countered by continuous inhalation of oxygen by tent or suitable mask Appropriate antibiotic therapy must be pushed if the pericardial infection is likely to be bacterial in type

Many rheumatic cases never progress to the stage of *effusion but if this complication arises further treatment* will depend upon its extent Small and moderate effusions cause little subjective discomfort whereas large collections of fluid induce a state of cardiac tamponade manifested by dysphagia vomiting increasing cyanosis and dyspnœa rapid and irregular pulse with falling blood pres ure Paracentesis must be done In cases following pneumonia empyema or general septicæmia aspiration is necessary for bacteriological diagnosis The choice of route is determined by the disposition of the exudate within the pericardium as judged by clinical and radiological features but trial and error is often the ultimate resort

Purulent effusions are aspirated on alternate days and if *the organism is penicillin sensitive 20 000 units in 2 5 ml of* normal saline should be introduced after each aspiration and *appropriate* intramuscular dosage given The broad spectrum

antibiotics are given orally when indicated by bacteriological findings Some recover after aspiration and appropriate antibiotic therapy while others require surgical drainage and toilet of the pericardial surfaces

ACTH and cortisone are of value in short history cases of rheumatic carditis Dosage of the former (as H P Acthar gel Armour) is 50-100 I U intramuscularly daily for 4-6 days and then tapered if progress is satisfactory Caution is necessary where an element of cardiac decompensation is present and methylprednisolone is safer (0 5 mg /lb daily until the inf ction is controlled)

Streptokinase-streptodornase preparations facilitate re moval of blood and pus from the pericardial cavity by aspiration The first mentioned enzyme liquefies fibrin clots and the second inspissated pus

All cases of pericarditis require four weeks rest in bed after active manifestations have passed Prolonged con valescence is essential and the patient ought to remain under surveillance for a considerable period Rheumatic and tuberculous subjects are given the long term observation and treatment appropriate to these infections Pericarditis of viral origin is usually benign and requires treatment on general principles

Pericardial Adhesions
Chronic Constrictive Pericarditis

Usually a sequel of tuberculous pericarditis

Medical treatment includes restriction of physical exertion, and rest in bed when necessary Ascites and œdema may be lessened by dietetic and diuretic measures Cases showing extensive extrapericardial adhesions carry a gloomy prognosis in the absence of operative treatment. Localised thoracoplasty will reduce the myocardial burden and do much to prevent invalidism.

In the chronic constrictive variety mediastinal adhesions are absent but the fibrotic and calcified pericardial layers form a rigid blanket round the heart and great vessels. Pericardectomy yields very successful results. The ventricles are widely decorticated but auricles and venæ cavæ are cautiously freed. Operation should be considered just as soon

as the diagnosis of cardiac compression can be made clinically Cyanosis distended neck veins small pulse volume low blood pressure large liver dry lungs and dropsy are suggestive Active tuberculous effusion is not a contra indication to operative treatment but an indication for preliminary *aspiration streptomycin cover and subsequent* prolonged chemotherapeutic course

DISTURBANCES OF CARDIAC RHYTHM

Premature Contractions

As a rule these require *no treatment unless associated with* major lesions Occasional extrasystoles are of no significance but they may arouse considerable mental perturbation in introspective subjects reassurance is often the most important detail of therapy

In more resistant cases gastric flatulence over eating tobacco alcohol and concealed dental sepsis are possible aggravating causes and the appropriate remedy should be advised Drug treatment is often disappointing but one or *other of the following* may abolish the premature contractions

Phenobarbitone gr ¼-½ thrice daily
Quinidine sulphate gr 6 daily for ten to twelve days
Procainamide 0 25 G twice daily
Potassium acetate gr 45 nightly

Frequent or recurrent premature contractions suggest that the heart may be damaged or in the grip of a toxæmia or herald the advent of major arrhythmia (paroxysmal tachycardia or fibrillation heart block) Digitalis coupling is a *signal for interruption* of therapy and potassium dosage as above

Paroxysmal Tachycardia

This may occur in apparently healthy hearts as well as in those affected by rheumatism myocardial infarction or thyrotoxicosis In the idiopathic group a tendency to neurosis and hypertension is frequently present The sudden onset of

rapid regular cardiac action (150 200 per minute) and its equally sudden cessation are characteristic. The attack may last for seconds or days and repetitive forms are common. If the arrhythmia is prolonged signs of cardiac failure may supervene although the condition is seldom fatal.

Treatment varies according to the site of origin of the abnormal rhythm and electrocardiographic diagnosis is therefore a matter of importance.

Supranodal type. Deep barbiturate sedation may be effective alone and a mild hibernation cocktail is useful for repetitive and resistant cases: promethazine (Phenergan M & B) 25 mg, chlorpromazine (Largactil M & B) 25 mg, phenobarbitone gr ½ thrice daily.

Vagal Stimulation

Methods. 1 Strenuous muscular effort during deep and prolonged inspiration. 2 Pressure on one or both carotid sinuses. The fingers should be applied to the carotid artery at the level of the mandibular angle and the artery compressed against the vertebræ. Several treatments of fifteen to thirty seconds duration may be necessary commencing with the right sinus. 3 Gagging reflex. Irritation of the pharynx with the finger or tooth brush. This is the most certain manœuvre. Unfortunately these methods tend to lose their effectiveness on frequent repetition and recourse may then be made to emetics, *e.g.* apomorphine gr $\frac{1}{10}$ hypodermically, tincture of ipecacuanha 2-4 drachms orally.

If the above measures are without avail the injection of parasympatheticomimetic drugs is often successful.

Neostigmine methylsulphate 1 1.5 mg intramuscularly and repeated once or twice at three hourly intervals.

Mecholin (Amechol Savory & Moore) 15 30 mg. intramuscularly.

Methoxamine (Vasoxine B.W.) 10 20 mg into vein or muscle.

Edrophonium chloride (Tensilon Roche) 10 mg. intravenously.

These drugs should not be given to asthmatic or cardiovascular degenerative subjects. They will often abort the

paroxysm within a few minutes and may be used in conjunction with carotid sinus pressure If they cause untoward reaction atropine gr $\frac{1}{150}$ should be used intravenously Frequent injection of these preparations may be harmful and their action by the oral route is uncertain

Quinidine sulphate is sometimes valuable in resistant cases It is best given in dosage of 0 3-0 5 G in 10 ml of normal saline into a vein Mouth dosage is also useful gr 6 two-hourly until the attack ceases (maximum five doses) but in prolonged paroxysms dosage of gr 12 16 two-hourly for three doses is more effective Procainamide (Pronestyl Squibb) is of limited utility in auricular tachycardias For dosage see below For desperate cases where cardiac failure threatens a single intravenous digitalising dose of digoxin (1 1 5 mg) or lanatocide C (Cedilanid 1 1 6 mg) may restore normal rhythm Carotid sinus pressure should be tried at intervals after the injection

Some patients can maintain freedom from attacks by taking gr 3 of quinidine sulphate thrice daily and increasing until an effective dose is found Procainamide 2-4 tablets daily is also worth trial

Nodal type Usually responds to digitalisation

Ventricular type Less common than the others but of more serious import as coronary occlusion may be the cause Digitalis and choline esters should not be given as they may induce ventricular fibrillation Quinidine sulphate is generally employed in initial dosage of 0 4 G intravenously followed by gr 6 by mouth two-hourly for one day This usually causes gradual slowing of the idioventricular rate to a point where the more rapid sinus rate will become dominant if unsuccessful twice this amount of quinidine should be given on the second day Once sinus rhythm has been re-established dosage should be reduced to maintenance level

Procainamide has a quinidine like action which has proved useful for treatment of cardiac arrhythmias It will abolish premature contractions temporarily and is effective against digitalis bigeminy The drug is more valuable in ventricular than auricular tachycardia results in the nodal type are fair Oral dosage is 3 5 tablets of 0 25 G followed by 2-4 tablets every four to six hours until normal rhythm appears A 10

per cent. solution is available for use in emergency (intramuscularly 10 ml over ten minutes intravenously 2-4 ml over two to four minutes) Intravenous use is mainly for prevention or correction of arrhythmias presenting in course of intrathoracic operations It may induce hypotension for which intravenous noradrenaline is required

Potassium salts (acetate gr 45 90) should be given in cases associated with potassium lack or digitalis intoxication

Heart Block

Possible ætiological factors should be considered and treatment planned accordingly Syphilis is an occasional cause and calls for the antisyphilitic routine applicable to cardiovascular cases Rheumatism and diphtheria are the commonest causes in young subjects Here the heart block usually disappears when the primary lesion has stabilised Bundle branch block is often a manifestation of myocardial infarction involving the interventricular septum

Sino-auricular block mild degrees of auriculo-ventricular dissociation (increased PR interval or occasional dropped beats) congenital heart block and Wolff Parkinson White types have no adverse effect on cardiac function and require no special treatment For high grade partial and complete auriculo-ventricular block the patient should be encouraged to live within his cardiac tolerance Digitalis and quinidine are as a rule contra indicated in partial heart block unless cardiac decompensation is present the former need not be withheld in established total A V block. Attempts at diminution of auriculo-ventricular block are not conspicuously successful but the following may be tried

Isoprenaline sulphate 20 mg. sublingually thrice daily

Ephedrine sulphate gr ½-1 twice or thrice daily

Methylamphetamine hydrochloride one to two 5 mg tablets daily

Prednisone has proved useful for A V block of recent onset not due to coronary occlusion.

However treated, cases of high partial heart block tend to gravitate into the dangerous Stokes-Adams syndrome Here

the best remedy is adrenaline 1 1 000 10-20 minims subcutaneously Hyperduric adrenaline A & H 1 ml subcutaneously is also useful and the effect may be reinforced by administration of ephedrine by mouth Barium chloride and thyroid extract are disappointing Oxygen inhalation in high concentration is essential in severe cases to relieve cerebral anoxia For prolonged ventricular asystole the only resource is injection of 1 2 ml of adrenaline 1 1 000 into the right ventricle ventricular fibrillation is abolished by an electrical defibrillator current

S Bellet gives 250 ml of M/1 sodium lactate by intravenous drip to increase the idioventricular rate and abolish Stokes Adams manifestations

Intraventricular block Treatment is that of the associated myocardial lesion

Auricular Flutter

Scherf and Prinzmetal established the similarity of the mechanisms of the auricular arrhythmias—premature contractions tachycardia and flutter

Paroxysmal flutter may occur in apparently healthy hearts Flutter may complicate rheumatic carditis and thyrotoxicosis it is not uncommon in coronary thrombosis and *myocardial degeneration* The ventricular rate varies from 140 to 300 per minute according to the degree of auriculo ventricular dissociation present Cases with 2 1 or 3 1 A V block often experience little inconvenience from this arrhythmia but anything which increases the ventricular rate may induce *palpitation and dyspnœa*

Many cases have an element of cardiac failure digitalis will slow the ventricular rate and full dosage should be given (see p 216) Normal rhythm may ensue or more commonly the flutter is replaced by auricular fibrillation This in turn may disappear within a few days of cessation of *digitalis therapy* if not it may be abolished by quinidine treatment (see p 218) An alternative method which is equally successful is to secure preliminary slowing of the ventricular rate by moderate doses of digitalis and then correct the flutter with quinidine Another useful method for cases in which prompt relief is required is to give 0 8 mg of a lanatocide C preparation intravenously and repeat in four hours Reversion to

sinus rhythm may follow quickly if not the drug is continued in daily dosage of 1 mg. Fibrillation frequently supervenes and this is an indication for change to quinidine

Paroxysmal flutter usually responds to sedation or to full doses of quinidine or procainamide

Auricular Fibrillation

May occur in paroxysms without evidence of cardiac defect. This arrhythmia is sometimes an expression of acute myocardial intoxication as in erysipelas and thyrotoxicosis. The most common origin is in mitral stenosis but it frequently heralds the terminal phase of hypertension and decrescent cardiopathy It is not uncommon in myocardial infarction and constrictive pericarditis

In the *acute fibrillation* of toxic states such as exophthalmic goitre the primary condition must receive appropriate attention Once thyrotoxicosis is controlled by antithyroid drugs the fibrillation tends to disappear if not quinidine therapy will usually prove successful Fibrillation accompanying acute infections in elderly subjects is difficult to control If endangering life by cardiac failure intravenous digoxin or strophanthin dosage is indicated Auricular fibrillation complicating coronary occlusion is often unresponsive to treatment but if a rapid ventricular rate persists in spite of the usual coronary treatment full dosage of quinidine should be tried Digitalis alone is said to increase the risk of inducing ventricular fibrillation but simultaneous administration of quinidine appears to offset this effect

In *paroxysmal fibrillation* precipitating factors such as overstrain focal infection dietetic indiscretions and excessive use of alcohol and tobacco may often be recognizable and freedom from attack will follow their discontinuance In cases where the paroxysms are infrequent prompt sedation, with interval treatment by a tranquilliser like benactyzine ('Suavitil' Paso dose 1 3 mg daily) may prevent them ... Frequently recurring or resistant attacks should be treated by a full course of quinine sulphate orally followed by maintenance dosage of gr 3 twice or thrice daily Digitalis

must not be used on account of its liability to perpetuate the arrhythmia

Many patients of the decrescent type with long standing slow auricular fibrillation enjoy fair health and the advent of cardiac decompensation may be postponed by the institution of a rational régime rather than by drug treatment Young rheumatic subjects with grossly damaged hearts do not stand fibrillation so well and there is little prospect of reversion to normal rhythm Here the aim should be to delay the advent of cardiac failure or mitigate its effects

If the fibrillation is of comparatively recent onset and there are no signs of gross cardiac damage an attempt should be made to restore normal rhythm

Digitalis The most generally useful drug in auricular fibrillation It slows the ventricle thus improving cardiac efficiency and normal rhythm may then be regained. For cases showing evidence of cardiac decompensation and without digitalis medication within twenty days the drug should be administered in full dosage

Digitalis leaf tablets are reliable in action economical and convenient Leaf is often better tolerated than more active preparations in maintenance therapy *Gr 1 5 of leaf (0 1 G)* is equivalent to 15 minims (1 ml) of tincture The initial digitalising dose is gr *9 on the second day gr 6 and* maintenance is gr *3*

Digitalin (digitoxin) is a glycoside of *D purpurea* which is unique in its rapid and complete absorption from the bowel *and slow elimination As the effects of* oral and intravenous administration are similar the latter offers no advantage except where vomiting is troublesome Tablets of 0 1 mg (gr 1/[illegible]) equal to 10 minims of tincture and 0 25 mg (gr 1/[illegible]) equal to 25 minims are available The digitalising dose is 1 1 5 mg and the maintenance dose approximately 0 25 mg daily

Digitalis lanata The representative glycoside lanatocide C is of uniform potency and does not require biological standardisation Another practical advantage is that being crystalline and soluble it is suitable for intravenous use It is more rapidly absorbed and excreted than the glycosides of *D purpurea* and is therefore less likely to cause

accumulation symptoms Cedilanid Sandoz, is pure lanatocide C and is available in tablets of 0 25 mg and ampoules of 0 4 mg. The oral digitalising scheme is

1st day	*2nd day*	*3rd day*	*maintenance*
3 5-6 mg	2 5 mg	1 mg	0 75 1 25 mg.

Digoxin is a product of lanatocide C hydrolysis and is the most popular digitalis preparation in this country Tablets of 0·25 mg (equivalent to 1 ml of tincture) solution containing 0·5 mg per ml (equivalent to 2 ml of tincture) and ampoules for intravenous use containing 0 5 mg are available The initial dose for a subject weighing 140 lb is six tablets followed by two tablets four hourly for six doses then one tablet four times daily Maintenance dose is one to three tablets daily

Strophanthus. Has no advantage over digitalis for oral medication but its glycosides act rapidly on intravenous injection Strophanthin is a mixture of amorphous glycosides, and it is useful for cardiac emergencies in dosage up to gr $\frac{1}{}$ Strophosid Sandoz, a crystalline glycoside of strophanthin k is of constant potency dose 0·5 mg by vein.

Intravenous medication is reserved for cases (without digitalis during the previous four weeks) of urgent cardiac defeat where immediate action is desired or where oral dosage is precluded on account of vomiting Any of the under mentioned preparations may be used

Solutions of

Cedilanid Sandoz or Digoxin	Strophanthin
0·5-0 75 mg	gr $\frac{1}{1}$

These should be diluted to 10 ml with normal saline and given slowly into a vein taking care to avoid spillage into the perivenous tissues. The initial dosage may in grave emergency be double these amounts or the above may be repeated in three or four hours Oral dosage as at the second stage *e g* one-eighth of the digitalising dose of tincture or two tablets of digoxin four-hourly or 2 5 mg. of Cedilanid in twenty four hours should be commenced as soon as practicable

[illegible] not be used on account of its liability to perpetuate the arrhythmia.

Many patients of the decrescent type with long standing [illegible] fibrillation enjoy fair health, and the advent of [illegible] decompensation may be postponed by the institution of a [illegible] regime rather than by drug treatment. Young [illegible] with greatly damaged hearts do not stand [illegible] so well, and there is little prospect of reversion to normal rhythm. Here the aim should be to delay the advent of cardiac failure or to mitigate its effects.

If the fibrillation is of comparatively recent onset and there are no signs of gross cardiac damage an attempt should be made to restore normal rhythm.

Digitalis. The most generally used drug in auricular fibrillation. It slows the ventricle thus improving cardiac efficiency and normal rhythm may then be regained. For cases showing evidence of cardiac decompensation and without digitalis medication within twenty days, the drug should be administered in full dosage.

Digitalis leaf tablets are reliable in action, economical and convenient. Leaf is often better tolerated than more active preparations in maintenance therapy. Gr. 1.5 of leaf (0.1 G.) is equivalent to 15 minims (1 ml.) of tincture. The initial digitalising dose is gr. 9; on the second day gr. 6 and the maintenance is gr. 3.

Digitoxin (digitoxin) is a glycoside of *D. purpurea*, which is unique in its rapid and complete absorption from the bowel and slow elimination. As the effects of oral and intravenous administration are similar the latter offers no advantage except where vomiting is troublesome. Tablets of 0.1 mg. (gr. [illegible]), equal to 10 minims of tincture and 0.25 mg. (gr. [illegible]), equal to 25 minims are available. The digitalising dose is [illegible] mg. and the maintenance dose approximately 0.25 mg. daily.

Digitalis lanata. The representative glycoside lanatoside C, is of uniform potency and does not require biological standardisation. Another practical advantage is that being crystalline and soluble it is suitable for intravenous use. It is more rapidly absorbed and excreted than the glycosides of *D. purpurea* and is therefore less likely to cause

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3 5 6 mg	2 5 mg	1 mg	0 75 1 25 mg

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These should be diluted to 10 ml with normal saline and given slowly into a vein taking care to avoid spillage into the perivenous tissues The initial dosage may in grave emergency be double these amounts or the above may be repeated in three or four hours Oral dosage as at the second stage *e g* one-eighth of the digitalising dose of tincture or two tablets of digoxin four hourly or 2 5 mg of Cedilanid in twenty four hours should be commenced as soon as practicable

The above mentioned cardiac drugs are all reliable and selection is largely a matter of personal preference The practitioner should familiarise himself with the action of two or three preparations Digoxin tablets and ampoules and digitalin tablets comprise an adequate armamentarium for most problems in digitalis therapy

Digitalis intoxication Minor manifestations (anorexia nausea vomiting) respond to temporary reduction or cessation of dosage gastric sedatives and a few oral doses of chlorpromazine In severe digitalis intoxication (multifocal ventricular ectopics bigeminy ST T deformity sino-auricular or auriculo ventricular block auricular fibrillation paroxysmal auricular tachycardia) the glycoside must be discontinued for several days after all evidence of toxicity has disappeared Potassium salts are protective and intoxication is readily induced in hypokalæmic states (following diuretic or corticosteroid therapy anorexia and defective potassium intake) For major arrythymias potassium citrate should be given in dosage of 4 G in fruit juice followed by two doses of 2 G at two hourly intervals The intravenous route is more effective (3 G potassium chloride in 500 ml 5 per cent glucose at the rate of 5 ml per minute Stop as soon as the arrhythymia disappears) For paroxysmal *ventricular tachycardia unresponsive to potassium* procainamide should be tried (750 mg orally followed by 250 mg hourly for three doses if oral dosage not retained give 0 5 ml of a solution containing 100 mg per ml every two minutes in an intravenous drip to a total of 300 mg followed by 50 mg every four minutes until 1 G has been given) If the blood pressure falls noradrenaline should be substituted Intravenous therapy should be monitored electrocardiographically

Quinidine Digitalis acts by improving the peripheral circulation and myocardial nutrition It also increases auriculo ventricular block and these effects are beneficial in fibrillation but no radical influence is exerted on the abnormal auricular conduction pattern Quinidine has a more direct action and may damp down the rate of discharge from ectopic auricular foci or improve auricular conductivity

In a successful case the auricular fibrillary movements are replaced by effective contractions and there is danger of auricular appendicular clots being expelled into circulation This danger has been overrated but it is customary to prescribe a preliminary two to three weeks anticoagulant course

Quinidine acts best in fibrillation of recent onset and in young rheumatic subjects rather than in elderly arteriosclerotics Gross valvular defect cardiac enlargement and the presence of decompensation are almost certain guarantees of failure It will often succeed temporarily in borderline cases but the advantage thus gained is doubtful Quinidin therapy gives brilliant results in a carefully chosen minority of fibrillators but digitalis is the drug of choice for the majority Milder examples often regain normal rhythm under its influence in more advanced cases the myocardial inadequacy element can be controlled and quinidine may then be used with enhanced prospects of success

Idiosyncrasy within six hours to a gr 3 dose in the form of headache tinnitus gastro intestinal disturbance or skin rash and development of intraventricular block at any time are indications for discontinuance of the drug Gr 3 tablets or powders are given thrice daily and the dose increased by gr 3 daily until the pulse becomes regular or a maximum of gr 48-60 daily is reached If necessary the maximum dosage may be gr 7½ two-hourly for twelve doses In successful cases the dosage is replaced by a maintenance one of gr 6 9 daily for weeks or months If however relapse is to be feared the successful dose should be tapered by gr 3 daily until the maintenance level is reached An excellent alternative method is to give quinidine gr 6 two-hourly for five doses daily over a maximum period of seven days Dosage need not cease if flutter supervenes

Effective quinidine therapy will increase the pulse rate and may provoke ventricular tachycardia It is therefore a most desirable preliminary that the pulse rate be reduced *to near normal by digitalis and sedatives*

Ventricular Fibrillation Cardiac Asystole

May appear as an agonal phenomenon It is a troublesome complication of general anaesthesia and thoracic

operations and may herald the beginning or end of cardiac standstill in Stokes-Adams seizures

Quinidine is the best remedy for the paroxysmal variety and when cardiac infarction is *present* *In cases arising* during anæsthesia prompt treatment is necessary to avert cerebral and myocardial anoxia which may prove fatal Adequate oxygenation should be maintained by artificial respiration using 100 per cent oxygen and quinidine given intravenously Cardiac massage through the open peri cardium will provide a minimal circulation if the thorax is already open this should be diverted to the areas of greatest need by compressing the aorta below the origin of the carotids The arrhythmia can be abolished by passage of small direct currents through the ventricular muscle mass and simple apparatus has been described by Birnbaum McMullan and others The first named uses a preliminary injection of 5 ml of 1 per cent procaine into the right and left ventricles and this is massaged into the coronary circulation the defibrillator current (100 V 2 amps 50 60 c A C for 0 1-0 2 sec) is then applied several times Momentary ventricular arrest follows adequate shocking which is usually replaced by normal ventricular activity *if not the routine mentioned* below must be instituted

Cardiac standstill is another unpleasant anæsthetic com plication the treatment of which is oxygenation and rhyth mical compression of the heart from apex to base If not effective 2 ml of 1 1 000 adrenaline should be injected into the right ventricle and manual compression repeated When *cardiac contraction* has been *re-established* the *blood* pressure should be supported by an intravenous drip con taining noradrenaline 4 mg or methoxamine (Vasoxine B W) 20-40 mg

An artificial pacemaker delivers a spot current to the region of the sino auricular node This method has proved effective in abolition of cardiac asystole

Pulsus Alternans

Not an arrhythmia but an expression of myocardial exhaustion Digitalis should not be withheld if signs of cardiac decompens*ation are pre ent*

Acute Carditis

Usually a complication of acute rheumatism scarlet fever or streptococcal tonsillitis Treatment is in general that of the causal condition All measures calculated to improve nutrition should be taken including the provision of a liberal and nourishing dietary Cortisone and the deltasteroids appear to have a useful rôle in rheumatic carditis (see p 50) When the febrile stage has passed fish liver oil and iron tonics are of value Prolonged and complete rest must be ensured During warm weather the child may be carried or wheeled to a balcony or garden and such hobbies and educational pursuits as are compatible with physical rest will prevent tedium Massage and exercises for the limb muscles help to maintain morale and body tone

There is no advantage in over prolonging the bed rest When the temperature pulse rate and blood sedimentation rate have remained normal for some weeks and the cardiac condition appears to be stabilised the patient should be allowed to sit up in a chair In a few days he is given the freedom of his bedroom or balcony for half an hour If no disturbance of the pulse rate results further increments of activity are allowed Dyspnœa palpitation and increased pulse or sedimentation rate are indications for temporary curtailment of physical exertion A prolonged holiday in the country or at the seaside will do much to rehabilitate the rheumatic child Cardiac colonies where they may live and receive education under ideal conditions are a noteworthy contribution to the problem

Periodic re-examination and after-care are necessary for several years Streptococcal infections of the upper respiratory tract should be warded off by long term penicillin therapy (see p 51)

Infective Endocarditis
Subacute Bacterial Endocarditis

All measures designed to conserve strength and increase resistance should be exploited Complete rest in bed nourishing food with vitamin supplements fresh air and sunshine are desirable Transfusions of blood or packed cells are the most satisfactory remedy for anæmia

The ætiology of the case may provide indications for treatment Those arising from metastatic infection should have appropriate treatment of the primary focus Where the endocardial infection is superimposed on a patent ductus arteriosus the ductus should be tied after a preliminary course of antibiotic therapy

Penicillin is the most generally effective antibiotic in infective endocarditis Sensitivity titres are a useful guide to dosage If the infecting organism is sensitive to this drug (the infecting organism is *Str viridans* in 90 per cent of cases and 90 per cent of these are sensitive) a thirty to forty days course of 2 mega units of crystalline penicillin daily by 6-hourly intramuscular injection should be given If the response is rapid and progress uninterrupted procaine penicillin (600 000 units twelve hourly) may be substituted during the latter part of the course In most cases defervescence is complete and the blood stream sterile within one week but if partial response is shown after a few days treatment penicillin dosage should be increased to 5 10 mega units daily over a period of forty to fifty days Relapse usually manifests itself within a month and should be combated by heavier antibiotic dosage Where the infecting organism is relatively in ensitive to penicillin one of the tubular blockade drugs should be used in addition to liberal penicillin dosage Probenecid (Benemid Merck Sharp & Dohme) is the most effective of the group and 0 5 G should be given six hourly by mouth It has no effect on streptomycin levels Oral penicillin has given good results in bacterial endocarditis but it should not be depended upon in the first instance

Some *Str viridans* and many *Str fæcalis* and *H influenzæ* strains show poor response even to heavy penicillin dosage for these a combination of penicillin and streptomycin is often effective 6 mega units and 1 2 G daily being a representative dose This combination has the advantage of bactericidal action whereas broad spectrum antibiotics are bacteriostatic only and may prove disappointing even when indicated by sensitivity tests

The tetracyclines and chloramphenicol are of value in occasional cases in which the organism shows insensitivity

to p n cillin and streptomycin coupled with sensitivity to one of the newer antibiotics Relapse is frequent and dosage should be in the region of 3 6 G daily over forty five days or longer if necessary If gastro-intestinal up et precludes adequate oral therapy chlortetracycline and oxytetracycline can be administered by vein for some days (600 mg twelve hourly) chloramphenicol is reasonably well tolerated intra musculariy or intravenously (600 mg six hourly) This will permit of lower mouth dosage The tetracyclines and erythro my in have part cular virtue in taphylococcal infections whereas chloramphenicol may be the ag nt of choice in infections due to Gram negative organisms Neomycin bacitracin, polymyxin and the nitrofurins have certain narrow indications in bacterial endocarditis

Since the advent of antibiotics th mortality of this disease has fallen from 97 per cent to under 30 per cent Delayed diagn sis is a factor in the still sub tantial death rate and it is unfortunate that bacteriological diagnosis is sometimes difficult or impossible The disease should be thought of in every case with a cardiac les on and fever persi ting over one week Elderly men with prostatic obstruction often have unsu pected enterococcal endocarditis

Chronic Valvular and Myocardial Lesions

During the *stage of compensation* no active treatment is required The severity of the lesion and the cardiac reserve should be estimated and the patient s mode of life a tered if nece sary in conformity with ardiac tolerance The danger of engend ring a needle s atmosphere of invalidism should be avoided Within the rule of moderation he sh uld be allowed to live as full a life as possibl if the occup tion is suitable he may be encourag d to continue with it but ample leisure and relaxation must be arranged for Any recreation in which he can indulge without appreciable discomfort is beneficial The patient habits regarding diet alcohol and tobacco are reviev ed and moderation impo ed Reasonable precautions should be taken to prevent colds chills and upper respiratory infections When such occur they must be treated wi h respect

bedtime is good in elderly patients as it reduces their sedative requirements The paroxysm can be cut short by oxygen inhalation and an intravenous dose of aminophylline The latter will abolish Cheyne Stokes respiration temporarily

Cardiac œdema Adequate digitalisation is of prime importance in the dissipation of dropsical collections Removal of pleural and peritoneal transudates by paracentesis will relieve dyspnœa and expedite recovery of water balance For massive œdema of the lower limbs multiple skin puncture with a glover s needle (under aseptic precautions) is of great assistance If possible the patient should be seated in a chair with the feet in a basin during the drainage process if skin puncture mu t be done with the patient recumbent mackintosh sheets are arranged under him so as to provide drainage into a basin on the floor Southey s tubes used in the same way are much more efficient as the needle punctures tend to seal with clotted serum Œdema of the scrotum and prepuce causes extreme discomfort and skin punctur s should be done under antibiotic cover

Comprehensive mechanical drainage with frequent changes of posture and adequate digitalis medication may be sufficient to prevent re-collection of dropsy if not further measures must be employed We have found a modified Schemm s routine valuable in cardiac œdema with reasonably good renal function The intake of sodium is restricted and reasonable fluid allowed Salt is omitted both in cooking and at table and sodium salts are not ordered in prescriptions The insipidity of this diet can be cloaked to some extent by the use of flavourings like lemon juice vinegar pepper etc. In a few days a satisfactory diuresis occurs with reduction of œdema If renal function is not grossly impaired mersalyl may be used to control dropsy A test dose of 0 5 ml should be given intramuscularly and if without untoward effect injections of 1 2 ml are given at intervals of four to seven days according to requirements Toxic manifestations are more likely to follow intravenous than intramuscular administration dimercaprol (BAL) is the best antidote (three 4 ml doses of 5 per cent oily solution at intervals of six hours into a muscle) Oral dosage with ammonium chloride gr 15 -0 in mixture or capsule four times daily will enhance the

diuretic action of mersalyl provided renal function is intact and the administration of this drug should commence on the day preceding and be continued for a day after each injection We have found mersalyl injection on two consecutive days in each week more effective than single doses at four day intervals The drug is disappointing if used in tablet or suppository form and the latter is not free from the danger of chemical proctitis Mercaptomerin sodium (Thiomerin Wyeth) is reputed to be less nephrotoxic than mersalyl In similar dosage it is equally effective in a more leisurely fashion

The tablet diuretic group includes acetazolamide Diamox Lederle dose 1 1½ tablets on alternate days amisometradine Rolicton Searle dose 4 tablets on the first day and then 2 tablets daily or more if required chlorothiazide Saluric Merck Sharp & Dohme is an effective oral diuretic which like amisometradine increases sodium chloride excretion by the kidney dose 1-4 tablets on the first day followed by 1 3 tablets daily on two to five days weekly according to response They are useful ad juvants or alternatives to mercurials being non toxic These are particularly acceptable for maintenance once heavy anasarca has been dissipated Chlorothiazide reduces potassium levels thus potentiating digitalis the effect of hypotensive agents is also increased

Cation exchange resins possess the property of selective absorption of inorganic ions and the acidic resins of car boxylic or sulphonic type will release hydrogen ions in exchange for sodium and potassium ions during transit through the intestine Their action is mainly to prevent absorption of dietary sodium, but urinary output of this cation may be increased also Their affinity for sodium is comparatively slight and unless modified by preliminary treatment with potassium they may induce hypokalæmia and hypocalcæmia with compensated acidosis Katonium Bayer Products (ammonium potassium sulphonic resin) may be given in dosage of 15-40 G daily in milk or fruit juice Initial diuresis is usually satisfactory but may not be main tained and some patients become intolerant of the large bulk. They are occasionally useful as temporary alternatives to

mercurial diuretics particularly in cases where the latter tend to lose their effect Some relaxation is allowable as regards the intake of dietary sodium during resin therapy

The danger of induced hypochloræmic alkalosis in patients on a prolonged low sodium-diuretic régime has already been stressed (page 207)

The xanthine group have a most uncertain diuretic action but may be helpful if used alternately with mercurial diuretics Theophylline ethylene diamine (aminophylline) is the most effective member of this group Dosage by mouth 0 3 G three to five times daily (liable to cause gastro-intestinal irritation) intramuscularly or intravenously 0 25 0 5 G

Left ventricular failure An acute emergency characterised by paroxysmal dyspnœa pulmonary œdema and cyanosis or pallor Hypertension and myocardial infarction are common antecedents

The patient should be propped up in the sitting posture and morphine gr $\frac{1}{4}$ injected intravenously to allay nervous excitement Venesection up to 20 oz should be done and aminophylline given by slow intravenous injection in dosage of 0 5 G dissolved in 10 ml of normal saline or better in 50 ml of 50 per cent glucose solution Oxygen inhalation should be given preferably from a positive pressure machine in hope of limiting pulmonary alveolar exudate While preparations for venesection are being made a nitroglycerin tablet of gr $\frac{1}{150}$ is given sublingually This diminishes venous return to the heart by increasing the splanchnic reservoir action and the same effect may be obtained by applying sphygmomanometer cuffs to all four limbs and inflating them to 50 mm for thirty minutes They should be released in rotation for ten to thirty seconds at intervals of five minutes Tolazoline hydrochloride (10 mg slowly intravenously) is a useful emergency measure by reason of its rapid vaso dilator effect A hexamethonium salt *e g* bromide 25 mg intra muscularly will rapidly ease the left ventricular burden in hypertensive subjects and *has largely displaced tourniquets* and nitroglycerin

Full digitalising therapy must be proceeded with and the intravenous route is usually imperative.

Cor pulmonale Right ventricular failure May present with cardiac abnormality such as pulmonary stenosis or with lung diseases like bronchitis emphysema embolism and fibrosis Pulmonary hypertension is a constant finding Severe dyspnœa cyanosis venous distention hepatomegaly and anasarca are usually marked

Treatment is that of congestive cardiac failure in general Bed rest light diet sodium restriction and aminophylline are beneficial Digitalis is often not dramatically successful but never harmful Diuretics especially mersalyl are an im portant item of treatment Oxygen inhalation is urgently necessary but some cases respond poorly due possibly to the respiratory centre having lost its sensitivity to CO and responding only to oxygen lack Such cases should have oxygen intermittently by nasal cath ter at first and be introduced gradually to the tent Dangerous hypoxic coma must be met by use of an intermittent positive pressure apparatus and intratracheal intubation using 5 per cent CO in oxygen Venesection is theoretically contra ind cated as the high cardiac output and polycythæmia are compensa tory but in practice many patients feel relief aft r removal of 10-15 oz of blood Sedatives are usually required and if possible a barbiturate or Pethilorfan Roche should be given in preference to morphine

Thrombo-embolic incidents in the course of cardiac decompensation serve to remind the practitioner of the fact that the precipitating factor in many cases is unrecognised myocardial infarction Where this possibility arises the prothrombin activity should be studied and anticoagulants used if indicated

For desperate cases of cardiac defeat radioactive iodine has been given in order to reduce metabolism and the cardiac load It is contra indicated if the radioiodine uptake is below normal

When the stage of convalescence is reached diet may be increased The patient is allowed up for gradually length ening periods and eventually may resume such activities as are considered suitable He should spend ten hours in bed out of each twenty four and the adoption of a regular rest day in each week will contribute to his well being He should

take sufficient digitalis and diuretics to ward off further episodes of cardiac decompensation

Surgical treatment Enormous strides have been made in the technique of valvuloplastic operations Mitral valvotomy is now an accepted routine in suitable cases Mitral stenotics may be classified *into*

1 Asymptomatic cases who do not require operation but should be kept under observation

2 Those who are well but have effort dyspnœa and usually show pulmonary hypertension

3 Cases in early failure (mitral facies dyspnœa on slight exertion *moist signs at the lung bases) or with* history of episodic failure

4 Cases of auricular fibrillation established failure embolism

Best results are obtainable in groups 2 and 3 in the latter invalidism can be averted by carefully timed valvotomy Cases *in group* 4 are *poor* risks but *in* view of the gloomy prognosis operation is justifiable provided that the patient can be brought to a state of reasonable cardiac competence

Contra indications to mitral valvotomy The most suitable age group is 20-40 Younger patients are liable to further rheumatic activity Patients in the early fifties have undergone the operation successfully Large left ventricle (aortic disease) or auricle (mitral incompetence) Minor degrees *of reflux* are not absolute contra indications Active endocarditis rheumatic or bacterial Patients in the last trimester of pregnancy

Brock s manœuvre of splitting the valve commissure by finger pressure or valvulotome through an auricular appendage incision is the operation of choice

The results of mitral commissurotomy have been surprisingly good In a series of fifty cases reported by Brock there were eight deaths seven of which occurred in the first twenty and one in the last thirty Cases in groups 3 and 4 show a higher mortality but the improvement in those who survive is sometimes remarkable The long term prospects cannot yet be vouched for a certain proportion of cases suffer restenosis and require further operation

Valvotomy via the left ventricle or aorta is done routinely for relief of non calcific aortic stenosis and stenotic pulm nary and tricuspid valves have been successfully incised

Heart disease and pregnancy Pregnancy and parturition throw added burd ns on the myocardium and kidneys in the presence of a serious lesion such as mitral stenosis fatal conge tive failure may be precipitated Women with asymptomatic cardia lesions may undergo several pregnancies without incident and many mitral stenotics are first dis covered at routine antenatal examination

Management of cases with a history of previous cardiac decompensation and of those showing signs of cardiac insufficiency early in pregnancy depends upon individual circumstances With continuous medical supervision and rest digitalis and an expeditious labour the outcome may be satisfactory If the patient s environment is poor and the cardiac history bad termination of pregnancy before the twelfth week may be desirable Termination at a later stage is no les hazardous than normal labour and pregnancy should be allowed to proceed the patient meanwhile receiving cardiac therapy and as much r st and freedom from domestic responsibility as possible If labour is likely to be prolonged rupture of the membranes and forceps extraction may be desirable cæsarean section is safer for primigravidæ and it affords opportunity for sterilisation if strongly indicated Cardiac decompensation must be corrected before any obstetrical procedure is contemplated A mitral stenotic with history of previous cardiac embarrassment should if possible have a valvotomy between the fourth and eighth month.

Personal and psychological con ideration should be care fully weighed before deciding the course of treatment Many cardiac patients withstand pregnancy and labour surprisingly well but repeated pregnancies may take heavy toll

Arteriosclerosis

Degenerative arterial change is an hereditary and irrever sible process but under careful management such patients may enjoy years of useful and happy existence Freedom from mental and physical strain is important but a light and

congenial occupation is beneficial Adequate rest and suitable outdoor exercise are to be encouraged and, if possible a rigorous climate should be forsaken for an equable one

Rigid dietetic extremes are unnecessary but moderation in food drink and tobacco should be enjoined The obese patient will benefit from a strict reduction régime Simple fare including one meat dish daily may be allowed Fatty foods butchers offals fish roes game meat extracts and soups made with meat stock should as a rule be eschewed and salt intake restricted There is considerable cir cumstantial evidence linking excessive di tary fat and arteriosclerosis Atheromatous plaques contain large amounts of cholesterol Present day dietetic tendency is toward hydrogenated fats and a high intake of saturated fatty acids connotes high levels of blood lipoproteins whereas consumption of unsaturated fats (vegetable and certain fish oils) is associated with low levels of serum lipoproteins Recent cardiac infarction subjects show high levels of plasma β lipoproteins Keys has noted the much higher incidence of vascular degeneration in Americans whose national dietary is rich in animal fat as compared with the olive oil and pasta habit of Italian pastoral com munities The evidence is still inconclusive but it would seem worth while to reduce the intake of animal fat and eggs

Drugs are without effect on the arteriosclerotic process but iodide had some reputation for symptomatic relief Vertigo and insomnia are lessened by phenobarbitone gr $\frac{1}{2}$ 1 twice daily or by Phenobarbitone and Theobromine Tablets B P C one thrice daily Syphilitic taint should be eradicated by the methods recommended for cardiovascular syphilis

When myocardial failure or vascular accident supervenes appropriate treatment should be instituted

Syncope Vasovagal Attacks

Fainting attacks may have a psychological basis—a dramatic escape from unpleasant situations and some are frankly hysterical These are responsive to psychotherapy

Hypotensive syncopal incidents may arise from various causes and the vasodepressor type is common Here the fall in blood pressure is due to vasodilatation in the muscular bed with constriction of the skin vessels and without compensatory increase in cardiac output owing to diminished venous return hence a critical level of cerebral hypoxia prevails Emotion fatigue anæmia and painful sensory stimuli are exciting factors Orthostatic hypotension may induce syncope without general autonomic disturbance and may be precipitated by starvation illness or exhaustion

Immediate treatment of hypotensive syncope is to place the sufferer recumbent with the head lower than the feet A hypodermic injection of adrenaline is effective if the attack is prolonged Recurrent syncope calls for complete physical examination if findings are negative benefit will follow general tonic treatment and small doses of ephedrine

The carotid sinus syndrome is found in elderly arteriosclerotics Turning the head abruptly wearing a tight collar or the presence of a carotid body tumour may evoke attacks by irritating a sensitive sinus Sensitivity can be tested for by careful digital compression of each sinus in turn and the resultant attack may be abolished by injection of atropine Frequent attacks lead to invalidism and denervation of the more sensitive sinus is indicated. A carotid tumour if present should be excised

Fainting due to other causes *e g* paroxysmal cough from laryngeal irritation or mediastinal compression hypoglycæmia hyperadrenalism should have treatment of the primary lesion

Arterial Hypertension

Usually associated with the degenerative changes common in middle life although vasospastic hypertension without appreciable vascular change is not rare Hereditary influences are often recognisable Cases occurring in various age groups may originate in a surgical kidney (or x radiation of these organs) Cushing s syndrome or phæochromocytoma and hypertension proximal to the block is a constant finding in adult aortic coarctation. Such cases are usually but not

invariably amenable to surgical treatment In the vast majority the cause is not known and the therapeutic edifice rests on unsound foundations

Many moderate hypertensives are symptom free the condition being discovered on routine examination Unless weighty reasons exist to the contrary the patient should not be informed and nothing more than general modifications in his routine advised Such a patient s life can be made miserable by induced neurosis if his abnormality is thought lessly exalted into a malady

By adoption of a quiet and regular mode of life the hypertensive may live comfortably with his disease for years those showing evidence of gross renal defect have such poor prognosis that little is to be expected from treatment

The sufferer should learn the secret of mental and physical relaxation and all treatment must be interlarded with practical psychotherapy designed to achieve this end Business and professional pursuits should be on a reduced scale and confined to such interests as can be supervised without undue mental or physical stress Diet and general *routine are as for arteriosclerosis correction of obesity is* important Kempner claimed substantial reduction of hyper tension from prolonged treatment with a 2 000 calorie diet consisting of rice fruit juices and sugar with vitamin and iron supplements Substantial lowering of blood pressure may be expected in 70 per cent of cases by virtue of the low sodium content (85 mg) The Kempner diet cannot be tolerated for more than a month or two because of its insipidity Whatever type of diet is used the sodium chloride content should not exceed 0 5 G daily

Mental tranquillity and sound sleep may be secured by the exhibition of hypnotics Phenobarbitone alone (gr 1 3 daily) or in combination with theobromine as in Theo bromine and Phenobarbitone Tablets B P C 1-4 daily is a popular remedy Iodides produce symptomatic relief in some cases but their value is greatest in the rare examples of syphilitic origin Venesection has a transitory effect not entirely divorced from the psychological Vasodilators have little effect on the general level of blood pressure and have been discarded in favour of ganglion blocking agents

Ganglion blocking agents Paton and Zaimis showed that the methonium halide compounds tetra (C4) penta (C5) and hexa (C6) cause blocking of sympathetic and para sympathetic ganglia The sympathetic effect is useful in hypertension while the parasympathetic block gives rise to side-effects such as ciliary paralysis dry mouth and skin constipation and urinary retention C5 and C6 may be used orally or parenterally but the oral route is uncertain and the dose must be five to ten times larger than the injection one This approximates closely the toxic level bromism is an added danger which can be averted by using tartrate or chloride Oral dosage should begin with 250 mg daily and be gradually increased until a moderate reduction in pressure is registered the average requirements being 500 mg four hourly As with all antitensive administration the patient should be up and about during stabilisation so that over shooting and severe postural hypotension may be avoided (cerebral or coronary thrombosis may be precipitated) Great caution must be observed in treating patients with renal defect as serious accumulation may occur Other disturbing side-effects are bowel upset ranging from constipa tion to paralytic ileus and retention of urine Aperients like senna and cascara are more useful than magnesia or liquid paraffin in this connection

Hexamethonium subcutaneously or intramuscularly is useful for the symptomatic therapy of hypertension Individual response varies and it is well to observe the effect of a small dose say 15 mg of Hexamethonium Tartrate Injection B P The amount may then be increased to 15 20 mg thrice daily and if this proves uneventful further increments are given until 150-200 mg daily is reached Continuous normotension is not the aim but a reasonable sustained fall with normal lability Tolerance of these drugs complicates therapy by either route but it diminishes after one or two months treatment dosage must be reviewed frequently

Best results are obtainable in cases of severe hypertension without gross vascular or renal change Lessening of symptoms such as headache vertigo insomnia and dyspnœa may be expected in suitable cases The treatment is often successful

in aborting encephalopathic episódes and is valuable in left ventricular failure It will control the secondary hypertension which often arises after an apparently successful sym pathectomy but unless care is exercised in dosage it will accentuate postural hypotension

Pentapyrrolidinium pentolinium (Ansolysen M & B) has a potency five fold that of hexamethonium bromide and the effect is more prolonged intolerance is less marked Oral dosage (unsatisfactory) is in the region of 20 mg. (test) after which 300 mg is given daily and increased by 20 mg daily until 1 400 mg is reached Initial subcutaneous dosage is 3 5 mg and this may be gradually increased to 30-60 mg daily The evening dosage should be double that given in the morning

In contrast to the ganglion blocking agents is the group with humoral antipressor action Hydergine Sandoz is a mixture of methanesulphonates of ergot alkaloids which has a peripheral adreno-sympatholytic effect 1 hydrazinophthalazine hydrallazine (Apresoline Ciba) inactivates several pressor substances *e g* pherentasin angiotonin while increasing blood volume cardiac output and most importantly renal flow It is given in mouth dosage of 100-800 mg daily by divided fractions It is useful in the same types of progressive benign hypertension as hexamethonium in the post sympathectomy hypertension and in malignant hypertension It has been given in combination with reser pine an alkaloid from *Rauwolfia serpentina* which has a similar but milder hypotensive action A syndrom similar to systemic lupus erythematosus has occasionally been attributed to this drug

Rauwolfia alkaloids exert a mild antitensive action and control mental excitement and agitation Occasionally a depressive psychosis may be induced and an antidiuretic effect occasionally leads to fluid retention and cardiac embarrassment The dose of reserpine (Serpasil Ciba) is 0 5 mg orally daily gradually increasing to 3 mg Useful in combination with mecamylamine or pempidine as it reduces the individual requirement appreciably

Mecamylamine (Inversine Merck Sharp & Dohme) acts by sympathetic ganglion block but being a secondary amine

intestinal absorption is satisfactory This drug is an effective hypotensive with more prolonged effect than parenteral pentolinium and tolerance is unusual Initial dosage 2 5 mg morning and evening gradually increased as necessary up to 100 mg daily Side effects particularly gastro intestinal may be prominent they resemble those described under hexamethonium and are treated by laxatives and salines

Pempidine tartrate (*Perolysen M & B Tenormal I C I*) is the most reliable and predictable antitensive available Dosage must be cautious initially 2 5 5 mg daily orally slowly increased to 10-40 mg in four divided doses daily Side effects apart from dry mouth and constipation are rare and tolerance is not a troublesome feature Renal defect necessitates very small dosage Pyloric stenosis and alkaline therapy are dangerous (the drug is best excreted in acid urine) Reserpine (under 0 5 mg daily) and chlorothiazide (up to 1 G daily) potentiate pempidine and with either smaller doses of hypotensive suffice (Hypokalæmia must be avoided)

Antidotes Methoxamine hydrochloride (Vasoxine B W) 3 10 mg intramuscularly or intravenously is a useful antidote to overdosage with hypotensive drugs Parasympathomimetic drugs will diminish the effects of parasympathetic block for blurring of vision—eserine eyedrops or spectacles with tinted corrective lenses for dry mouth—gr 1/32 pilocarpine in water before meals for abdominal distention urinary retention impotence—15 mg neostigmine subcutaneously

Surgical treatment Smithwick s extensive dorso-lumbar sympathectomy produces appreciable lowering of blood pressure levels *The operative mortality is not negligible and* at best the hypotensive effect wears off in one to three years Smithwick s experience suggested that groups with ocular cerebral cardiac or renal change where the diastolic blood pressure is not above 140 and without extensive renal damage show a much better survival rate than medically treated controls The operation will sometimes prolong life and preserve useful vision in progressive malignant hypertension

The scope of sympathectomy has narrowed with the advent of reliable hypotensive agents but the operation has a place in cases intolerant of dietetic and drug routines and postoperatively the patient will be more sensitive to hypotensives. Thorn submitted a small series of hypertensives with advanced cardiovascular complications to total adrenalectomy. Blood pressure reduction was not universal in the survivors but symptomatic improvement resulted in all. In other clinics the results of this operation have been mixed. Replacement therapy by cortisone is necessary.

Hypertensive encephalopathy. Episodes consisting of severe headache, vomiting, visual disturbances, convulsions and transient pareses may complicate simple or malignant hypertension. They must be distinguished from uræmia, cerebral vascular accident and cerebral neoplasm. The immediate prognosis is usually good and they should be treated by venesection (up to 20 oz.), withdrawal of cerebrospinal fluid by lumbar puncture and parenteral pentolinium. Hypertonic solutions, *e.g.* 50 per cent glucose 50 ml. intravenously, are useful in emergency. Morphine is indicated if the convulsive state persists. Severe hypertensive crises respond best to hypothermia (see p. 304).

Hypertension with renal involvement requires treatment as for chronic nephritis.

Coronary Occlusion

Early diagnosis is important. Many cases show a warning phase and if such herald symptoms as unaccustomed breathlessness on exertion, substernal discomfort or unusual dyspepsia on exertion after meals are correctly interpreted the outlook is greatly improved.

In the attack two urgent priorities present themselves: absolute rest and relief of pain. The patient should be put to bed with a minimum of effort on his part and a subcutaneous injection of morphine given (gr. ¼–⅓) and repeated if relief is not obtained within the hour. If devastating pain and severe shock are present morphine gr. ¼ should be given intravenously at the onset. Other suitable anodynes are methadone 20 mg. intravenously and Papaveretum Injection B.P.C. 1 ml. intramuscularly. Oxygen inhalations in

concentration of 90-100 per cent by B L B or other efficient mask or tent are used routinely during the first eight to twelve hours in some clinics for relief of myocardial hypoxia Vasodilators such as amyl nitrite by inhalation aminophylline (0 25-0 5 G intravenously) and papaverine (gr 2-6 intra venously) are often ordered but their value is a matt r of speculation and the use of amyl nitrite is not without risk

Persistent primary shock is associated with a mortality of about 80 per cent Some cases respond to pressor amines with distinct improvement in outlook Secondary shock is u ually accompanied by cardiac failure and digitalisation is required in addition to vasopressor therapy Results in this group are in general disappointing

L noradrenaline (l arterenol Levophed Bayer Products) exhibits a profound vasoconstrictor action and is safer against hypertension than adrenaline in that the cardiac output is not increased bradycardia rather than tachycardia is the rule and the cerebral stimulant effect is slight The contents of one 4 mg ampoule are added to one litre of glucose saline blood or plasma according to whether dehydration anaemia or pure peripheral va cular collapse predominates Each ml of tran fusion fluid contains 4 μg of *l* noradrenaline and the intravenous drip is adjusted to 20-30 drops per minute in order to maintain the blood pressure above 100 mm Hg (the initial requirement is usually about 2 ml per minute) In a succes ful case the blood pressure tends to stabilis around this figure after twenty four to forty-eight hours when the *l* noradrenaline drip may be gradually dispensed with Regular blood pressure observa tions are essential during treatment and careful watch must be kept for signs of venous overload (pulmonary basal moisture venous distension) Venospasm sometimes inter feres with drip flow this may be lessened by heating the limb by hot packs or el ctric pad

In omnia mu t be combated by a barbiturate and patients who are mentally or physically restless benefit from a tran quilliser we have found the phenobarbitone-promethazine chlorpromazine cocktail (p .11) most us ful after the second or third day

Food may be neglected for twenty four hours after this a light varied diet is allowed If the patient is *overweight* the intake must be adjusted accordingly Smoking should be given up during the stage of bed rest *After forty-eight hours* the bowels may be moved by liquid paraffin and magnesia but harsh aperients are to be avoided *By the fourth day* if all goes well he may be allowed to rise to a commode placed beside his bed. Exercises of the limb and respiratory muscles should be practised daily to discourage phlebothrombosis and by the eighth day a patient who presents no untoward signs or symptoms may be allowed to sit in a chair by the bedside for five minutes and the time gradually extended

In cases of average severity rest should be maintained for three weeks in order to permit the establishment of collateral circulation to the infarct area. Mental tranquillity is important but boredom is to be shunned The invalid may be allowed to sit up in bed for washing and for meals after the second week. If free from symptoms he should devote the fourth week to sitting quietly in a comfortable chair to moving around the bedroom and visiting the bathroom if stair-climbing is not involved By the end of the seventh week the average patient is up for about eight hours has the freedom of his house (including a minimum of stair-climbing) and can take short walks in the garden or on level roads without discomfort By the end of the twelfth week resumption of a modified business or professional routine as a half timer is usually safe Dyspnœa and substernal discomfort at any stage are indications for temporary restriction of physical activity

Except in young subjects return to occupations involving much physical or mental strain is undesirable The intelligent patient will seek a suitable compromise for six or twelve months after which time his cardiac limitations will be assessable The liability to recurrence should be explained to the relatives

Anticoagulant therapy Heparin and the coumarins are used to prevent extension or dissemination of intravascular thrombi and there is evidence (although not undisputed) that the risk of recurrent infarction is thus lessened Anticoagulant therapy is *more* essential in the poor

risk cases than in mild cases in which the mortality is estimated as low as 1 per cent. Many clinicians reserve anticoagulants for elderly patients and those with previous history of coronary accident persistent pain or shock major arrhythmias gallop rhythm antecedent hypertension with enlarged heart obesity diabetes or other debilitating ill ness it is in these that the risk is greatest Patients whose prothrombin activity has been adequately controlled may safely be allowed out of bed sooner than those not so treated It is important to continue anticoagulant therapy for at least two weeks after resumption of modified activity

Heparin acts on the clotting mechanism present in the circulatory blood within thirty minutes and it is used initially to cover the twelve to thirty six hour latent period of oral anticoagulants A solution containing 5 000 i u (62 mg) p r ml is convenient for intravenous use 10 000 i u is given six hourly during the first twenty four hours and thrice on the second day The clotting time should be maintained at fifteen to twenty minutes Heparin solutions of 25 000 i u per ml. may be used in dosage of 15 000 i u twelve hourly by intramuscular injection for cases where intravenous dosage is impracticable They prolong the clotting time satisfactorily but extensive hæmatoma formation may follow this risk can be minimised by placing the solution deeply in the muscle mass with a fine gauge needle and by applying pressure for a few minutes afterwards This route is not recommended for frail elderly subjects Dextran sulphate (Dexulate Glaxo) intravenously is reported equally effective and more prolonged in action

The oral anticoagulants act by depressing hepatic pro thrombin formation and daily or alternate daily prothrom bin activity estimations are essential for safe therapy 300 mg of dicoumarol is given orally on the first day and 200 mg on the second and third days Usually the drug is adminis tered twice daily the dose being adjusted in accordance with the day s prothrombin figure The aim of treatment is to reduce prothrombin activity to 20 per cent. of normal if allowed to fall below 10 per cent hæmorrhages are liable to occur The maintenance dosage varies from 50 to 150 mg

daily and treatment should be kept up for four to eight weeks or in certain cases for months or years 'Tromexan Geigy an oxycoumarinyl derivative has displaced dicoumarol on account of its shorter latent period and less cumulative effect Dosage initial 900-1 200 mg followed by 300-600 mg daily Warfarin sodium (Marevan Evans) is said to be the most satisfactory anticoagulant Daily dose 30-70 mg

Phenindione (Dindevan Evans) is a popular synthetic anticoagulant. Potency is intermediate cumulation is slight and individual requirements tend to be stable Administration and control are as for the coumarins Dosage is 200 mg. in the first twent four hours and 100 mg. in the second maintenance is in the region of 25 75 mg daily

Anticoagulant overdosage if due to heparin can be corrected by one or more intravenous injections of 2 5 ml of 1 per cent solution of protamine sulphate Transfusion of fresh whole blood is necessary if bleeding is severe Manifestations of *coumarin and phenindione toxicity e g hæmaturia* and purpura are controlled by phytomenadione (Konakion Roche) 10 mg intramuscularly or 1 2 10 mg capsules in milk Severe bleeding is met by transfusion Contra indications to anticoagulant measures are hæmorrhagic diatheses ulcerative lesions *e g* peptic ulcer unhealed wounds poor renal or hepatic function subacute bacterial endocarditis and advanced pregnancy some would add senility to this list

Digitalis is indicated in the presence of congestive failure but it should be used with circumspection on account of the danger of provoking ventricular fibrillation Quinidine sulphate (gr 6 two hourly for six doses) or procainamide (250-500 mg orally three hourly) should be given for auricular fibrillation or paroxysmal tachycardia complicating coronary occlusion Some physicians employ these prophylactically in cases showing frequent premature ventricular contractions Conduction defects tend to lessen spontaneously as healing progresses For ventricular tachycardia procainamide solution 2 10 ml intravenously slowly is the most effective remedy

For left ventricular failure aminophylline 0 5 G in 50 ml of 50 per cent glucose given slowly into a vein will help

to limit pulmonary oedema Aminophyuine should be continued in oral dosage (0·75 G daily) Oxygen inhalations are of value (For management of cardiac arrhythmias see page 210)

Angina Pectoris

The general routin described for arteriosclerosis and hypertension should be followed Exertion should when possible stop short of provoking pain and factors predis posing to attack su h as flatulence tobacco cold and strong winds should be avoided Worry emotion and excitement are detrimental. Syphilis if present should be cautiously t eated on the l nes suggested for cardiovascular mani festations

Va odil tors such as papaverine aminophylline sodium nitrite and glyceryl trinitrate are sometimes of as istance in lessening the frequency of attack Combined treatment with phenobarbitone gr 2 3 daily and Glyceryl Trinitrat Tablets B P gr $\frac{1}{130}$ sublingually every four hours gives best results Triethanolamine trinitrate (*Praenitrona* Schering) is given in oral dosage of 3 8 mg daily With a background of this drug less frequ nt recourse to nitro glycerin is necessary Rauwolfia preparations are useful as background therapy also particularly in subjects prone to excitement and hypertension Pentaerythritol tetranitrate exerts a very indifferent vasodilator action Sublingual nitroglycerin remains the most effective treatment of the anginal attack and it should be used promptly at earliest warning.

Radioiodine therapy has been sugge.ted for intractable angina It benefits the suffe er by le sening circulatory demands and the physiological responses to adrenaline Nicotinic acid and testosterone propiorate are occasionally used in effort angina following cardiac infarction Status anginosus should have treatment as d tailed for coronary thrombosis

Where frequent anginal paroxysms make the patient s life a burden one or other of the surgical measures designed to lessen cardiac ischaemia may be considered they are not conspicuously successful

To lessen pain and coronary spasm

Anterior rhizotomy in which the upper four or five thoracic nerve roots are divided on both sides

Paravertebral block preferably by procaine This is the most popular resource

Cervicothoracic ganglionectomy in which the stellate and T1 5 sympathetic ganglia are removed on one or both sides.

To improve the coronary circulation

Implantation of the internal mammary artery into the myocardium

Partial occlusion of the coronary sinus by ligature alone or with formation of an anastomotic channel between the aorta and coronary sinus

Insertion of talc powder into the pericardial sac which causes vascular adhesions

Aneurysm

The principles enunciated for the management of arteriosclerosis hold good Rest is of prime importance and the diet should be light and dry Syphilitic aneurysm should be treated by iodides bismuth and penicillin Symptomatic measures for the relief of pain and hypertension are usually necessary

The scope of vascular surgery has widened during the past decade The present tendency is to excise saccular aortic aneurysms Excision of the dilated segment with replacement by aortic homograft or plastic tissue has proved successful Dissecting aortic aneurysms can be dealt with if in the ascending arch by providing a re-entry to the aortic lumen if situated in the descending arch by excision of the false entry segment or of the intima Fusiform abdominal aortic aneurysms may be reinforced by a plastic wrap around Peripheral aneurysms present fewer problems than aortic and the results of surgical removal are gratifying

Peripheral Arterial Obstruction

This may be caused by embolism or thrombosis In the latter case the obstructed vessel has previously undergone

degenerative change Obstruction in an arteriosclerotic subject results in gangrene of a distal portion of the limb Embolectomy is feasible if the case is seen early later amputation is usually necessary

Interim treatment consists of keeping the ischaemic portion of the limb cool by exposure to the air The rest of the body should be maintained in an air temperature of 110 F by electric cradles The skin of the affected limb must be kept surgically clean by the use of spirit and antiseptic dusting powders Tolazoline hydrochloride (Priscol Ciba) and pyridylcarbinol (Roniacol Roche) have been used intravenously for their vasodilator action with doubtful benefit Sympathetic block with procain will improve the collateral circulation and anticoagulant therapy is of value

Localized intra arterial block is amenable to surgical attack For example thrombosis of the aortic bifurcation (Leriche's syndrome) may be relieved by thrombo-endarterectomy segmental resection with insertion of homograft or provision of a by pass according to extent and distribution of the endarteritis

Intermittent Claudication

A troublesome manifestation of endarteritis and arising from muscular hypoxia induced by exercise It adds a distressing limitation to the patient's activities Tocopherol and tolazoline and other vasodilators are of no value Lumbar ganglionectomy in patients under sixty years who show good response to vasomotor tests may relieve cold feet but not the claudication pain Extensive ulceration gangrene or myocardial defect are contra indications Arteriography frequently demonstrates a localised occlusion of the popliteal artery here a graft arranged to surmount the block is curative Patients who are unsuitable for sympathectomy on account of age or general condition eventually gain relief by amputation

Tenotomy of the tendo achilles will relieve pain of gastrocnemius or soleus origin pain in the anterior tibial peroneal group is lessened by section of the external popliteal nerve but these operations have obvious disadvantages

Thrombo-angiitis Obliterans Buerger s Disease

Tobacco is undoubtedly harmful and should be given up Alcohol is of some therapeutic service on account of its vasodilator action A month s rest in bed is advisable at the outset especially in the presence of thrombophlebitis Loose warm clothing should be worn and heat provided by the use of electric pads or cradles The Buerger method of passive vascular exercise may be given trial

With the patient lying supine the affected limb is elevated to an angle of 60 to 90 for one-half to three minutes until blanching appears It is next allowed to hang down over the bed edge for two to five minutes until hyperæmia occurs The limb is then placed horizontally and heat applied by means of hot water bottles or an electric pad This sequence is repeated for an hour and several sessions are gone through daily

The rocking bed treatment is favoured in some clinics Ulcers must be dealt with surgically

Lumbar sympathectomy is of value in the distal types of thrombo-angiitis particularly those which show very slow progression Operation is contra indicated in severe arterial insufficiency and gangrene

Polyarteritis Nodosa

A necrotising pan arteritis with collagenous degeneration involving the arterial system generally Symptom patterns are complex and the disease often fatal Treatment is directed to maintenance of nutrition which is something of a problem in view of the protracted and debilitating nature of the illness Liberal diet vitamin supplements blood transfusion fresh air and bed rest are essential and ymptomatic indica tions should be met as they arise Pyrexia is usually unresponsive but penicillin or chlortetracycline is worthy of trial Asthma polyneuritis anæmia renal hepatic and cardiac involvement are treated routinely Cortisone is of considerable value in some cases although renal lesions are resistant

Temporal Arteritis

Characterised by visible inflammatory changes in the temporal arteries but many other arteries are involved Pyrexia headache visual defect and mental change are common Biop y of the affected temporal artery or peri arterial sympathectomy have given relief Vitamin B con centrates chlort tracycline and cortisone have also been credited with cures

Raynaud s Syndrome

May be symptomatic of various conditions such as syphilis lupus erythematosus thrombo-angiitis obliterans cervical rib and myelomatosis It is an occupational risk in pianists typists and those who handle vibratory tools Raynaud s disea e occurs most frequently in young women has no ætiology other than poor circulation and is often inherited It is an expression of reaction to cold and in milde form is the dead fingers of sea bathing addicts A warm climat is ideal Cigaret e smoking should be given up A l beral nourishing d et with full allowance of fats and vitam n supplements is benefi ial Drugs have very limited value in this condition but tolazoline hydrochloride 4 tablets daily may be tried in mild cases β pyridylcarbinol (Ronicol Roche) a nicotinic acid derivative ha a similar but more sustained dilator action on the arterioles Oral dosage 100 200 mg daily Cortisone has been used with some success in sclerodermatous cases

Exposure and chilling of the extremities should be avoided warm woollen garments loose mitten fur lined gauntlet gloves without separate finger compartments two pairs of stockings (one of wool) and fleece or fur lined boots are desirable Irrita ion and trauma of the extremities mu t be avo ded since trophic ulceration is slow to heal

Sympathectomy is usually reserved for the disease rather than the syndrome and it raises the threshold for cold in cases show n_a sev re and progressive vasospa m, scleroderma or painful superficial skin ulcera ion The extent of the sympathectomy varies with the s verity of th scle oderma If the face neck and arms are affected T1 5 roots a e interrupted

Peripheral Venous Thrombosis

This condition occurs in debilitating states *e g* pneumonia *the post-operative state* and in *elderly* bed fast subjects Prevention is on the lines *mentioned in page 269 For* treatment complete bed rest with immobilisation of the affected leg by sandbags and cradle together with a soothing local application *e g* glycerin of ichthyol

Anticoagulant therapy is desirable in extensive cases until moderate activity can be regained (p 241) Cortisone phenyl butazone and para aminosalicylic acid have been recom mended for the active stage and they certainly relieve pain *Passive movements should begin when local pain and œdema* have subsided and the patient encouraged to walk (with bandages on both legs) to prevent further incidents The use of a donkey or pillow under the legs or slouching in an easy chair *should* be avoided both *for* prevention and cure as they impede venous return *from* the lower limbs

Thrombophlebitis migrans. In addition to treatment of each thrombotic incident a prolonged course of anticoagulants should be given Ligature of the veins and occasionally of the *inferior vena cava may be necessary*

Congenital Heart Lesions

Minor abnormalities such as small septal defects and cusp lesions give rise to no symptoms unless infection supervenes Cases with pulmonary obstruction and veno-arterial shunt suffer from cyanosis and dyspnœa which are *accentuated by muscular effort* Aortic coarctation produces a compensatory arterial hypertension and the proximal aorta may become the seat of degenerative changes

Treatment, other than surgical is directed to *limiting the* child s activities *in* proportion to the circulatory defect later he becomes most expert at doing this for himself Upper respiratory infections rheumatism and septic lesions in *general have dangerous potentialities in these cases and* every care must be taken to prevent their occurrence

The surgical treatment of congenital cardiac anomalies has of late made phenomenal progress

Patent ductus arteriosus Ligature and preferably division of the ductus lessens the substantial risk of infective endocarditis The elective operation introduced by Gross should be done at about the age of four years although good results (with higher operative risk) attend its performance even in adult life If operated on before the age of twelve years growth and development approximate normal For established infective endocarditis adequate antibiotic therapy should be instituted and the ductus ligatured as soon as the blood stream has been cleared of organisms Cases showing permanently reversed shunt are unsuitable for surgery

Coarctation of the aorta The adult type of deformity if distal to the origin of the left subclavian artery is corrected by excision with end to-end suture of the aorta The more extensive infantile type of deformity is treated by excision of the constricted portion of the aorta and anastomosis between the left subclavian artery and the side of the aorta distal to its division Excision of an extensive constriction with insertion of a homograft has been successfully accomplished Other aortic anomalies such as double arch and congenital aneurysm of the descending aorta have been remedied by operation

Congenital pulmonary stenosis and Fallot s tetralogy The provision of an anastomosis between a subclavian or innominate artery or aorta and pulmonary artery will improve the pulmonary circulation and correct cyanosis Operation should not be done before the age of eighteen months between five and ten years is the best time In older patients the vascular structures are less resilient and technical difficulties of the operation are increased Pulmonary systemic shunts of the Blalock Potts type have a mortality of 10 per cent but afford symptomatic relief in about 80 per cent of cases Brock has attacked the problem fundamentally and his valvotomy technique gives excellent results in subjects with isolated valvular stenosis He has also devised a resection operation for infundibular stenosis but the ventricular septal defect should ideally be repaired at the same time. These operations are rapidly becoming more effective due to improved technique and in a given case the decision as to whether they are likely to give better results

than anastomotic procedures is not always easy Some cases of Fallot s tetralogy are unsuitable for valvotomy but there remains a large proportion in whom the question of shunt versus valvotomy propounds itself The latter is more physiological and removes an anomaly whereas the anastomotic operation adds one

Septal defects. Surgical attack on these has been hindered by the difficulty of working blindly in a bloody field Bigler and his colleagues found that by cooling the body metabolic processes could be damped down sufficiently to allow interruption of the cardiac pump for a short period without harm Good progress is being made with the extra-cardiac circulatory pump which will solve the problem of a dry operative field Meanwhile Gross has closed mall interatrial defects by suture and sizable defects by suturing a nylon patch over the defect His approach is through a funnel shaped rubber well which i sutured to the left auricle before opening that chamber The well fills with blood which is heparinised and this temporary loss of blood from circulation is compensated for by transfusion

Cardiac Neurosis

A diversity of symptom patterns all loosely mimicking true cardiac lesions are produced by imaginative patients who labour under psychological difficulties There is often a familial or environmental background conducive to neurosis Many cardiac neuroses originate in uninformed or ill considered medical advice The diagnosis of a tired strained or weak heart the prohibition of games to a schoolboy in the absence of proven cardiac defect or the magnification of minor increases or decreases of blood pressure into pathological entities may sow the seeds of needless invalidism

Effort syndrome is the commonest form of cardiac neurosis and it burgeons in time of war Conscripts from sedentary occupations are forced into the discipline of a herd existence The strenuous training of a soldier in war must of necessity be imperfectly graded at times finally he is thrust into a bloody business for which he has no stomach These factors operating on an inadequate personality may call

forth protective disability in the guise of chronic headache intractable dyspepsia or cardiac discomfort

Treatment is difficult and not conspicuously succes ful Complete physical examination should be mad at the outset and negative findings may reassure the sufferer The psychophysiology of the patient s symptoms should be explained to him and abreaction technique is often effective in cases arising out of battle stress or cata trophic accidents Care fully graded physical re-education at the hands of capable and understanding instructors will cure a proportion of cases Psychiatric analysis of the patient s environmental maladju t ments with guidance for their resolution is helpful Recrui s should be allotted to various arms of the service on results of psychiatric assessment at entry A system of interview selection of entrants to industry has pro ed mutually beneficial to management and labour force

CHAPTER XIV

DISEASES OF THE RESPIRATORY SYSTEM

Acute Catarrhal Rhinitis

Treatment of the common cold is largely empirical In the invasive stage a hot bath an aperient a diaphoretic and twenty four hours rest in bed will often cure the complaint For established infections confinement to bed in an even temperature for two or three days is the best remedy Febrile *symptoms should be treated by* an alkaline diaphoretic mixture or by a few doses of aspirin and Dover s powder Inhalations of steam medicated with menthol or friars balsam help to relieve nasal obstruction caused by mucosal turgidity Decongestants such as ephedrine 0 5 per cent in normal saline may be sprayed or instilled into the naso pharynx three or four times daily Nasal douches sometimes spread infection to the accessory sinuses or Eustachian tubes and their use is to be discouraged

Sinus block is a frequent concomitant of nasal infections and causes characteristic pain and sense of fullness If unimproved by the use of Penicillin and Ephedrine Nasal Drops B N F a pledget of cotton wool containing 5 per cent cocaine may be inserted in contact with the middle turbinate for fifteen minutes Frank sinus infection requires surgical treatment usually replacement of exudate by penicillin solution

Premature return to everyday duties should be frowned upon

Chronic or recurrent colds raise the presumption of nasopharyngeal or pulmonary disease and appropriate investigations are called for

Acute Tonsillitis

The patient should remain in bed in a comfortably warm room until the temperature has fallen to normal A light

pultaceous diet consisting of gruel jellies milk foods ice cream sweetened fruit juices and barley water is satisfactory The possibility of diphtheria should be excluded by examination of throat swabs but the question of administration of diphtheria antitoxin must be decided on clinical grounds without waiting for culture results Other conditions in which sore throat is common such as scarlatina glandular fever and syphilis must be borne in mind

Tonsillitis due to acute streptococcal infection responds to sulphonamide therapy and penicillin is even more rapidly effective Penicillin is the best remedy for infections with Vincent s organisms Two or three doses of 200 000 units or 1 2 ml of procaine penicillin intramuscularly daily will usually control acute tonsillitis within forty-eight hours

Patients should not be entrusted with sulphonamide or antibiotic preparations for continued local use *e g* lozenges and nasal drops as sensitisation may follow their indiscriminate employment

Cervical adenitis Quickly relieved by effective antibiotic therapy Kaolin poultices are useful Abscess formation requires surgical treatment

Peritonsillar abscess. Energetic penicillin therapy will abort the condition if commenced early The abscess involves the soft palate and usually points in the supratonsillar fossa between the fifth and ninth days The patient should sit upright or recline on the affected side and the head is steadied by an assistant A head light is essential A stout bladed bistoury is sterilised and wrapped so that only half an inch of the blade at the point is free The tongue is protected by a tongue depressor and a downward stabbing incision about ½ inch long made over the point of maximum bulging usually at the intersection of two lines, one drawn horizontally through the base of the uvula and the other at right angles to this and touching the anterior faucial pillar (keep away from the base of the uvula and the upper pole of the tonsil) Further treatment consists of frequent gargles of hot saline If the abscess has ruptured spontaneously drainage should be facilitated by inserting the closed points of a sinus forceps and opening the blades slightly A general anæsthetic is unnecessary except for children

Chronic or recurrent tonsillitis and quinsy are indications for tonsillectomy during a quiescent interval

Hay fever

The unpleasant manifestations of this condition may show a strictly seasonal incidence limited to the pollination period of the plant responsible A second type is the perennial vasomotor rhinitis in which more general sensitivity exists to dusts and animal dandruff as well as to pollen

The allergic nose rarely benefits from surgical interference but gross abnormalities should be corrected Skin sensitivity tests should be done by scratch patch or intradermal methods using pollen and dust extracts which are available from Messrs Bencard Messrs Duncan Flockhart and others Sometimes a particular pollen can be incriminated from the patient s history but this should be confirmed by skin tests Grass pollen is the most frequent offender

Cases of the perennial type often react to a multiplicity of dissimilar substances and non specific immunisation must be tried

Preparations of group and single allergens in common use are obtainable commercially others can be had to order Attempts should be made to raise the patient s threshold to attack by a course of fifteen to thirty graduated injections of the offending protein Best results are obtained by commencing the course in January and using twice weekly intervals in the beginning and weekly intervals with larger doses If leisurely prophylaxis is impossible the course may be given by daily or alternate daily injections Dosage should be large but stopping short of dermal nasal or general reaction A few minims of adrenaline mixed with the early doses will retard absorption and improve tolerance Larger doses of adrenaline must be given to control sensitivity reactions Reaction should be met by halving the dose and working up again Severe reactions respond to prompt administration of ephedrine gr ½ 1 or adrenaline 1 1 000 solution 5 10 minims hypodermically Antihistaminics and cortisone are useful for prevention and cure Local reactions may be disregarded

Co-seasonal treatment For latecomers already beleaguered

by their particular pollen Freeman's rush inoculation method may be used The patient should be admitted to hospital and graduated subcutaneous injections given at 1½ hourly intervals by day for two or three days

Treatment of the attack Ephedrine gr ½ thrice daily is a useful stand by and should be taken throughout the pollen season The wearing of tinted spectacles helps to keep the conjunctivæ free of pollen

Adrenaline is the most efficient drug If given early in the attack a few minims hypodermically brings prompt relief while Hyperduric Adrenaline and adrenaline in oil will maintain freedom for several days Sufferers who are averse to self injection may use tablets of isoprenaline 30 mg under the tongue on rising

A severe attack may be rapidly terminated by cortisone 150-300 mg orally daily reducing to 12 5 25 mg daily for maintenance deltasteroids one fifth these amounts

The antihistamine drugs such as diphenhydramine hydrochloride Benadryl P D are useful palliatives in hay fever and hay asthma They sometimes produce a considerable measure of relief particularly in cases where the allergen cannot be identified They should be given during the period of desensitisation until the latter has progressed sufficiently to limit symptoms Initial dosage should be small *e g one* capsule or tablet night and morning and in the absence of undesirable toxic effects (drowsiness nausea vertigo and syncope) this may gradually be increased four fold Diphenylpyraline Histryl Spansules S K & F one 5 mg capsule night or morning is effective over many hours in prevention of attacks

Local applications

Hydrocortisone as snuff or nasal drops (*e g* Cortibiotic Roussel) is by far the most satisfactory

Ephedrine 0 5 per cent in normal saline

For instillation into the nostrils and eyes on rising

Laryngitis

Acute The sufferer should remain in a well ventilated but warm room the voice is rested and smoking forbidden

should receive attention otherwise treatment of the bronchitis is likely to fail Chronic bronchitis of any severity is irreversible and often coexists with other pulmonary diseases such as emphysema fibroid tuberculosis bronchiectasis and pneumoconiosis and diagnosis ought to be considered provisional until the possibility of a more serious pulmonary lesion has been excluded

A dry equable climate is most suitable Young patients do well at Alpine resorts where pure dry air and a maximum of sunshine are available but elderly patients with long-standing bronchitis and myocardial change respond poorly to high altitudes

The sufferer should spend as much time as possible out of doors when the weather is mild Deep breathing and setting up exercises are encouraged and mouth breathing and slouching postures condemned postural drainage is useful where sputum is profuse Tobacco and alcohol should be forbidden Under nourished patients are given liberal diet with full allowances of protein and fat obesity increases dyspnœa and stout subjects may with advantage undergo reduction treatment

Drugs Expectorants rarely live up to their reputation but the following may be tried

A warm saline draught on waking (see p 257)

Ammonia and Ipecacuanha Mixture B P C may be reinforced by a few grains of potassium iodide

A drachm dose of sedative linctus (Codeine Linctus B P C Squill Opiate Linctus B P C) on retiring will suppress cough

Antispasmodic remedies are of value where an element of bronchial spasm exists Lobelia and Stramonium Compound Mixture B P C or one containing potassium iodide gr 2 ephedrine hydrochloride gr ½ tincture of belladonna 7 minims and ethereal tincture of lobelia 10 minims may be tried

Chronic bronchial infection is little responsive to chemotherapy but exacerbations are frequent during the winter months usually caused by upper respiratory infections

These should be promptly and efficiently treated by confinement to house or bed and exhibition of a suitable antibiotic Penicillin streptomycin and erythromycin are valuable in many cases but for some a short burst of a tetracycline or chloramphenicol is more effective Continuous therapy with broad spectrum antibiotics throughout the winter months has given good results with little in the way of side-effects (acute and severe respiratory infective incidents 10 G chloramphenicol over five days A H Iranndis *et al* 1957 advanced purulent bronchitis oxytetracycline or tetracycline 0 5 1 5 G daily throughout the winter J R May and N C Oswald 1956)

Inhalation therapy Penicillin and streptomycin aerosols are now rarely used as their good effect is short lived Detergent mists (Alevaire Bayer) are useful in liquefying tenacious sputum. They may be combined with deep breathing postural drainage and cough routines

Emphysema

Usually coexists with chronic bronchitis and much of the treatment outlined above is applicable Occupations involving exposure to expiratory stress *e g* glass blowing and those demanding strenuous physical exertion or exposure to the elements should be abandoned Breathing exercises designed to deflate the chest and improve the abdominal musculature are of some value in early cases Routines designed to secure free movement of the diaphragm and lower ribs should be practised In more extensive cases an artificial pneumoperitoneum will assist expiratory ascent of the diaphragm For advanced cases expectorants and antispasmodics are helpful. Nocturnal dyspnœa causes apprehensiveness and loss of sleep for which a combination of ephedrine aminophylline and phenobarbitone should be prescribed Franol tablets Bayer are useful for this purpose If bronchial spasm is prominent temporary relief follows inhalation of Isoprenaline Sulphate Compound Spray B P C Myocardial weakness calls for rest in bed venesection digitalis and aminophylline Oxygen inhalations are of some value in treatment of cor pulmonale. (See p 249)

Pneumonia

Lobar pneumonia A bright well ventilated sick room should be chosen and the air temperature maintained at 65 F A single bed with a firm mattress facilitates nursing Absolute rest must be enjoined during the pyrexial stage afterwards in the absence of complications the patient may be allowed to rise to the commode Diet should be liquid or semisolid in the early stages Fruit drinks sweetened with sugar or syrup fruit jellies milk and its modifications soups bread butter and weak tea are all acceptable Bowel action may be ignored for the first few days of illness unless discomfort arises when an oil enema or biscodyl Dulcolax suppository may be used

A precise bacteriological diagnosis is desirable and may be obtained by culture of blood sputum and nasopharyngeal swabs Chemotherapy should not be delayed pending the results of these examinations

Drugs The majority of organisms responsible for lobar pneumonia are sensitive to sulphonamides and this therapy is often indicated on grounds of expediency but if a satis factory response is not obtained within twenty four hours penicillin should be given as well Sulphadiazine and sulpha dimidine are two of many suitable preparations For a moderate to severe case 3 G should be given initially then 2 G in four hours followed by 1 C four hourly until the temperature has been normal for thirty six to forty-eight hours 0 5 G doses are then given at six to eight hourly intervals for three to four days A fluid intake of 4-6 pints with sodium bicarbonate 2-4 drachms daily must accompany the sulphonamide dosage

Penicillin is the therapy of choice for lobar pneumonia and it will usually produce speedy resolution of pneumo coccal streptococcal and staphylococcal infections 1 2 mega units of crystalline penicillin daily by six hourly intramuscular injections is the routine for average cases After defervescence change may be made to twice daily intramuscular injections of 1 ml of a procaine penicillin and many use this type of penicillin throughout the pyrexial period Once fever has abated daily injections are sufficient Oral penicillin V is effective and trouble free (125 250 mg

four hourly) Erythromycin and allied preparations are valuable in cases where penicillin is indicated and probably more so in staphylococcal and diphtheroid pneumonias (1 2 G daily)

Streptomycin is of value in some pneumonias which are inadequately controlled by penicillin and sulphonamides e g those due to infection with enterococci *H influenzæ* *K pneumoniæ* (Friedländer) Estomycin Glaxo is a penicillin ester streptomycin combination and each adult dose phial contains 500 000 units and 1 G respectively This may be given daily

The tetracyclines and chloramphenicol have no advantage over the older remedies in pneumococcal infections except in circumstances where injections are impracticable Their use should be reserved for infections with unusual organisms such as staphylococci klebsiellæ hæmophilus where specifically indicated by sensitivity tests of sputal flora also in psittacosis and other virus pneumonias Pseudomonas pneumonia rare in this country responds to polymyxin 1 5 mega units intramuscularly daily in divided dosage

If the disease resolves without incident the patient may be allowed up after seven days freedom from fever convalescence should be lengthy and iron fish liver oil and vitamin concentrates are useful

Symptomatic treatment Pleural pain is often troublesome at the outset and should be met by application of heat in the form of kaolin poultices or an electric pad Restlessness delirium and insomnia occur in alcoholic and debilitated subjects for sedation paraldehyde 3 drachms in whisky or 3 5 ml by intramuscular injection is least depressant Alcohol may be necessary in those who are addicted and it is sometimes a useful soporific in elderly abstainers Barbiturates such as soluble barbitone gr 10 or quinalbarbitone gr 1½ 3 by mouth may be tried in resistant cases active delirium is best controlled by morphine or Pethilorfan Roche

Myocardial weakness calls for intravenous administration of digoxin 0 5 mg. or strophanthin gr $\frac{1}{120}$ followed by one digoxin tablet (0·25 mg) by mouth four hourly for six doses adequate maintenance therapy should be arranged Noradrenaline (Levophed Bayer) 2 mg in 0·5 litre of

physiological saline may be given by intravenous drip for critical circulatory failure Hydrocortisone hemisuccinate by vein is likewise useful for tiding the seriously ill patient over the crisis (See p 34)

Oxygen therapy Oxygen inhalations are of service in the presence of restlessness cyanosis or cardiac weakness These are most frequently encountered in young children and elderly subjects It may be administered simply and efficiently by means of a B L.B or other close fitting oronasal mask and a flowmeter and washing bottle should be incorporated in the circuit By closing the air intake ports a high concentration (up to 100 per cent) can be given The rate of flow should be about 6 litres per minute and the reservoir bag should distend well with expiration

Oxygen tents are of two types the enclosed (Oxygenaire) and the open (St George s pattern) The enclosed types consist of an air tight plastic envelope or canopy which encloses the patient s head and trunk Light nursing routines can be done through cuffs in the envelope A CO_2 absorber dryer and cooler are incorporated in the circuit so that the contained air can be accurately conditioned Smoking and lights are forbidden near the tent as are electric bell pushes The open type consists of a funnel of transparent plastic material which fits snugly round the neck The oxygen enters at the bottom near the mouth where a high concentration is required and waste gases spill over the open top This tent is cheap and efficient

Complications Pleural effusion is the commonest and it may become purulent Serous effusion if small requires no special treatment larger collections should be aspirated Purulent effusions must be drawn off daily or every other day and replaced by 250 000 units of penicillin in 15 30 ml of normal saline until the exudate becomes sterile Parenteral antibiotic therapy based on bacteriological data should also be given A few empyemata clear up satisfactorily under this *régime but surgical drainage and toilet of the pleura* are required if the purulent collection is encysted interlobar multiloculated or too thick for removal by aspiration Streptokinase and streptodornase may be injected intrapleurally to aid liquefication of fibrin and thick purulent

exudates but thev rarely replace surg cal tod t which should not b~ unduly dela}ed

Decortication is necessary where the lung is bound down by a thick fibrinous pleural exudate Closed drainage is to be preferred as it encourages pulmonary re-expansion and obviates mediastinal shift Breathing exercises are of great value in this connection

Pericarditi meningitis and arthritis require appropriate treatment

Bronchopneumonia Treatment is in general similar to that des~ribed above The condition is often superimposed upon some other illness which will require appropriate treatment

Primary atypical pneumonia Probably due to virus infection and unresponsive to sulphonamides and penicillin Dosage with the broad spectrum antibiotics appears to shorten the course of this disease although its comparative rarity benign course and difficult diagnosis make evaluation of new lines of treatment somewhat unsatisfactory Chlor tetracycline is given in divided daily dosage of 1 1 5 G by mouth until d fervescence is complete

Harvester s lung A diffuse pneumonic condition caused by inhalation of fungi or disintegration products which abound in poorly saved hay Occupational incidence is marked the disease being confined to farm workers and animal fodder storemen It occa ionally leads to pulmonary fibrosis and bronchiectasis Treatment is by potas ium iodide gr 100-200 daily

Asthma

The patient s history should be reviewed in order to elicit evidence of allergy If a protein or protein group can be identified a. cau al the patient should if possible be excluded from contact therewith or desensitised The influence of emotion in precipita ing asthmatic attacks is well known, and psychological factors should be sought for Expert psychi atric guidance is often helpful particularly in children, where a parental attitude of over anxiety may encourage the child to dramatise his malady The patient s mode of life may have important bearing on the disease Exposure to cold damp and dusty atmospheres is harmful. Irregular meal hours and

unsound dietetic tendencies must be avoided Abnormalities of gastro-intestinal function should be corrected and a plain nutritious diet given Where the attacks are frequent and severe temporary resort to a lacto-vegetarian regime may help to break the vicious cycle Nocturnal asthmatics should not take late evening meals Carbohydrate metabolism is occasionally defective and a depressed sugar tolerance curve is an indication for dosage with 2 oz. glucose daily The asthmatic should be encouraged to live as full a life as possible and any tendency to an atmosphere of invalidism dispelled Recreation in the open air is particularly beneficial

The influence of dental tonsillar and sinus infections and of nasal polyposis has been variously estimated but there is no doubt that asthmatic phenomena can be aggravated by their presence Ritual operations such as turbinate cautery produce only ephemeral benefit

A complete examination of the chest should be made associated conditions such as bronchitis emphysema and tuberculosis will dictate modifications of treatment Radiology and bacteriological examination of the nasopharyngeal and bronchial secretions may afford helpful information.

It is often worth while to study the allergic state of young subjects but in long established cases where the spasmodic phenomena have become less clear-cut and an overlay of emphysema and bronchitis complicates the picture pursuit of allergic tendencies is rarely profitable Using the solutions commercially available for skin testing it is found that about 10 per cent of asthmatics show definite reaction to a single protein or group of proteins If the offending protein is a food stuff it should be excluded from the diet if it is a ubiquitous substance like house dust or horse dandruff an attempt may be made to render the sufferer hyposensitive by a graduated series of subcutaneous injections Many asthmatics show general sensitivity by reacting to a bewildering assortment of heterogeneous proteins and for these non specific desensitisation should be tried Mixed Inhalants Solution Bencard is a preparation of considerable general utility It is obtainable in combination with pollen extract for use in cases of hay asthma and in strengths suitable for initial and continuation treatment (see p 254)

Whatever desensitising agent is emp oyed it is imperative to avoid general reactions

Asthma which is nocturnal in incidence calls for exclusion in turn of the allergen found in bedrooms A horse hair mattress feather pillows eider down quilt and woollen blankets are possible offenders Som sufferers are sensitive to dusty carpets and as a last resort wall paper may be removed and the walls painted Asthma is a capricious disease and a change of room or an inconsiderable change of locality may confer freedom

Physiotherapeutic measures are valuable especially in child asthmatics Gymnastics postural and deep breathing exercises and heliotherapy all have merit in individual cases The exercises are designed to restore thoracic mobility and correct overdistension Complete expiration with emphasis on the rôle of the diaphragm and abdominal muscles must be taught (See Breathing Exercises G M Storey Faber 1958)

Drugs Iodides and anti pasmodics are useful for routine treatment (Lobelia and Stramonium Compound Mixture B P C or a mixture containing ephedrine hydrochloride gr ¼ tincture of belladonna 7 minims and ethereal tincture of lobelia 10 minims three or four times daily) Caffeine Iodide Elixir B P C is a good routine remedy and may be taken in dosage up to 4 drachms daily

An evening sedative is indicated when the attacks occur at night A powder containing gr 1 each of ephedrin and phenobarbitone may be given Ephedrine gr ½ with butobarbitone gr 3 is another useful bed time medication The antihistamine drugs are of doubtful benefit in spasmodic asthma but are occa ionally of value for episodic treatment of child asthmatics and of hay asthma

Treatment of the attack REMEDIES WHICH MAY BE SELF ADMINISTERED

1 *Sedati es and antispasmodics by mouth* Quinalbarbitone sodium gr 3 and ephedrine gr 1 Isoprenaline Sulphate Tablets B P 0 mg or *l* isoprenaline bitartrate Isolevin Wyeth tablets of 15 mg sublingually

2 *Antispasmodics by inhalation* Adrenaline 1 100 with

glycerin This is combined with other antispasmodics e g atropine methyl nitrate sodium nitrate and papaverine in Adrenaline and Atropine Compound Spray B P C and in many proprietary inhalants such as Rybarvin Isoprenaline Sulphate Compound Spray B P C is more effective in some cases and a short inhalation will often terminate the attack. *L* isoprenaline bitartrate Isolevin Wyeth is an effective bronchodilator These may be used in a hand or power operated atomiser

3 *Adrenaline* 1 1 000 *by hypodermic injection* The most generally useful remedy 3 5 minims at the beginning of the attack is much more effective than a large dose later

FOR ATTACKS NOT AMENABLE TO THE FOREGOING THE MEDICAL ATTENDANT MAY TRY

Adrenaline 1 1 000 given by the Hurst method A hypodermic syringe is charged with 20 minims of adrenaline One minim is given subcutaneously and the syringe is then strapped to the patient s skin and the remainder given at the rate of one minim per minute A better result is often obtained if the Hurst dose is divided into four or five subcutaneous injections in various sites Delayed action adrenaline (adrenaline in oil adrenaline mucate Hyper duric adrenaline A & H dose 0 5 1 ml) is useful in some cases

Status asthmaticus If resistant to the foregoing measures often yields to aminophylline 0 25-0 5 G in 10 ml of saline intravenously Morphine is better omitted in view of its depressant action on the respiratory centre and its sup pression of the cough reflex Pethilorfan Roche *50-100* mg intramuscularly is a less objectionable antispasmodic. Drug addiction is easily induced in asthmatics so that morphine and its analogues should be avoided whenever possible Sedation is necessary in most cases soluble pheno-barbitone gr 3 intramuscularly is safe but a basal dose of bromethol rectally is more certain

Inhalations of oxygen should be given to patients who show respiratory distress A mixture of helium 80 per cent and oxygen 20 per cent is said to give better results than oxygen alone

Antibiotics A thmatics are notoriously responsive to hospital routine and it is difficult to assess the value of any single i em of treatment In cases where an elem nt of pulmonary bronchial or nasal sinus infection is present systemic therapy with an appropriate antibiotic is a valuable mea ure

ACTH and cortisone In severe asthma and status asthmaticus the administration of these hormones induces a quiet interval of one to four weeks in which the bronchospasm and respi atory difficulty reced lost sl ep is made up nutrition is imp oved dehydration corrected and nervous tension abolished A useful ini ial remedy is hydrocortisone 100 mg in 500 ml saline intravenously by slow drip Cortisone in oral dosage of 200-300 mg daily gradually reduced to 12 5 50 mg for as long as the asthmatic tendency is present was until recently the most popular steroid medication. Prednisone and m thylprednisolone are equally effective in about one fifth of the corti one dosage range and minimal dosage may be continued for months if nece sary

Bronchiectasis

Study of the aetiological background will frequently provide helpful information Such details as a history of bronchopneumonia or inhaled foreign body are not without significance Congenital cystic disease pulmonary collapse from bronchial neoplasm and coexisting tuberculo is are pos ib e factors Clinical examination supplemented by bronchoscopy and bronchography gives indication of the location and extent of the bronchial dilatation The pulse and temperature record leucocyte count and erythrocyte sedimentation rate enable the physician to as ess toxaemic factors

Med cal treatment is palliative but should be used in every case The patient should have rest in bed in the open a r during mild weather When he becomes afebrile suitable activities may be resum d A liberal nouri hing dietary is important as most bronchiectatics are toxic and debilitated Iron tonics and fish liver oil preparations are valuable The disease may be aggravated by epsis of the oropharynx and nasal sinuses and such should be attended to

Postural drainage The penetrating fœtor of the sputum is largely due to the retention factor and drainage is encouraged by postural coughing several times daily Posture slapping percussion and cough exercises are very much the province of a skilled physiotherapist For basal bronchiectasis *the patient should lie over the edge of his bed with* the head hanging down This will induce coughing and he then turns on the side of the sound lung Apical cavities are drained by sitting upright and leaning away from the side of the affected lung Lateral cavities are drained by lying horizontally on the sound side and afterwards hanging over the side of the bed Postural drainage beds are available in most hospitals *The amount of sputum should be recorded* daily Bronchoscopic drainage is a useful pre-operative routine

Expectorants with the exception of the morning saline draught are useless Penicillin and streptomycin by injection have considerable palliative value and they (or the broad spectrum antibiotics) should be used during periods of acute pneumonitis and as a preparatory measure where operation is contemplated Blood transfusions play an important part during the operative phase

Surgical treatment Modern diagnostic procedures facilitate *recognition of the disease at an early stage* when radical cure is comparatively free from hazard and often brilliantly successful Lobectomy and segmental resection are the operations of choice and in capable hands yield good results in cases of unilateral disease particularly in children and young adults Bilateral segmental resection is occasionally feasible but cases with extensive bilateral lesions are unsuitable for surgery

Pulmonary Abscess

Significant ætiological conditions must be sought for Inhalation of infected material after tonsillectomy and dental extraction accounts for a proportion of lung abscesses Suppurative pneumonias *e g* those due to Klebsiella and staphylococcal infections tend to excavate and pre-existing diseases *such as bronchial neoplasm infarct and bronchi*ectasis are frequently associated with lung abscess

Systemic resistance should be improved by nourishing food rest in bed in the open air and tonics The sputum should be cultured and the appropriate antibiotic administered (usually penicillin) Thus the s ppurative process may be lim ted and septicæmic complications prevented

Bronchoscopy and bronchography provide an exact regional diagnosis Foreign bodies of suitable size may be extracted endoscopically and suction drainage of the ab cess cavity inaugurated Postural drainage is sometimes eff ctive and in conjunction with inhalation therapy and systemic antibiotics may keep a small ab cess cavity empty enough to permit healing Thick walled cavities must be dealt with surgically Thoracotomy with dissection of the fibrotic cavity lining and packing will give excellent end re ults in many cases Lobectomy offers a p ospect of cure in chronic and exten ive abscess formation

Pulmonary Infarction

Thrombotic forms are due to di ease of the pulmonary artery with chron c venous conge tion or to localised disease of th lung tissues Embolic forms follow the im paction of wandering blood thrombi fragments of valve vegetations malignant metastases fat or oil globules Phlebothrombosis of the leg veins is by far the commonest sou e

Absolute rest in the most comfortable posture should be adopted M rphine gr $\frac{1}{4}$ with atropine gr $\frac{1}{150}$ is injected if there is much re piratory distress or chest pain. Lange recommends the intrapleural injection of 20-30 ml of 0 5 per cent procaine which relieves pain and permits of normal respiration Shock and collapse are met by stimulants such as nikethamide or an intravenous saline drip conta ning l noradrenaline (4 mg to one litre) Oxygen inhalation is valuable particularly if cy nosis is present Right ventricular defeat may occur in severe cases and must receive adequate treatment

Pneumonia frequently supervenes and should be antici pated by the initiation of suitable ant biotic measures

Many pre and post-operative routines have been devised to prevent venous thrombosis and pulmonary embolism

Smoking should be given up for four to six weeks before elective surgery and adipose tendency corrected by suitable diet While on the operating table the calves of the legs should be protected from pressure by pads of sponge rubber placed underneath Fowler s position is conducive to venous stagnation and is an undesirable post-operative routine as is sitting slumped in an armchair Frequent alterations of decubitus and encouragement of deep breathing and active muscular movements are of greatest importance as is correction of dehydration The patient should be allowed to stand and walk and use the commode as soon as possible These measures are particularly necessary in elderly obese and debilitated subjects and in those who have lost and had replacement of considerable quantities of blood The incidence of embolism in such patients can be reduced by the *wearing of elastic stockings while confined to bed* as moderate compression improves the deep venous return from the legs

Anticoagulant therapy Used prophylactically in predis posed cases or when the earliest signs of phlebothrombosis appear in order to encourage recanalisation

Heparin Three doses of 12 000 i u of heparin intra venously at not less than six hourly intervals the third being given late in the evening On subsequent days three or four doses of 8 000 units are used After disappearance of pyrexia and of swelling from the phlebothrombotic site the dosage is reduced to two injections of *8 000* units daily for a few days The patient should perform free muscular movements in bed and if practicable he is allowed up on the *fourth day provided he wears an elastic bandage or Unna s* paste sock on the limb to prevent œdema If early ambulation is undesirable daily or alternate daily dosage with heparin is continued for two to three weeks Dextran sulphate is replacing heparin in some clinics

Coumarins After oral administration dicoumarol depresses hepatic synthesis of prothrombin by interference with vitamin K utilisation For details of this treatment see page 241

Trypsin Enzymic thrombolysis using specially purified *trypsin for intramuscular injection* is thought to be a more effective measure in thrombophlebitis than anticoagulants

Surgical measures. Ligature of the common femoral or iliac veins is used in conjunction with anticoagulant therapy to prevent embolic spread to the lungs Ligation of the inferior vena cava is a major project which will protect against pulmonary embolism. Crane (1957) lists three indications pulmonary embolism from ileofemoral thrombosis where anticoagulant therapy has failed or is contra indicated after femoral vein division and anticoagulants have failed pulmonary embolism from septic thrombophlebitis

Pulmonary Œdema

May arise from chemical irritation by failure of the left heart or as a terminal manifestation of renal disease It is sometimes associated with coronary occlusion and allergic states Treatment depends on the cause but must be prompt

The patient should adopt the sitting position with the legs down A hypodermic injection of morphine and atropine is given together with a slow intravenous injection of aminophylline 0.5 G Venesection is often of benefit and continuous oxygen inhalation should be commenced The latter is more valuable if humidified and given under positive pressure from an anæsthetic apparatus

Luisada postulates that the main cause of circulatory embarrassment from pulmonary œdema is the foaming propensity of the muco-serous transudate Ethyl alcohol on inhalation has an anti foam action He advises inhalation by nasal catheter of a mist produced by passage of oxygen through 95 per cent alcohol

Adequate digitalis must be given in cardiac cases particularly those with auricular fibrillation In cases of recent cardiac infarction the oral route is safest and quinidine or procainamide should be given as well in hypertensive left ventricular failure slow intravenous injection of a hexamethonium salt is indicated (bromide 5 15 mg)

The allergic variety responds to adrenaline 10-20 minims by scattered subcutaneous dosage and an antihistamine *e g* chlorpheniramine Piriton A & H 10 mg intramuscularly

Pulmonary Atelectasis

The treatment of localised collapse is that of the primary condition usually bronchial ob truction Management of a massive collapse likewise depends upon the cause If due to wounds of the chest wall these should if practicable be treated by surgical toilet and closure if not tampon dressings are indicated Those caused by collection of air or fluid in the pleural cavity are treated by aspiration and maintenance of normal intrapleural pressure The incidence of post operative pulmonary collapse may be reduced by the following precautions cessation of smoking correction of obesity and treatment of upper respiratory infections patients with productive cough should undergo postural drainage for a few days judicious premedication and choice of *anæsthetic* and *terminal hyperventilation of the lungs* with CO_2-O_2 mixture relief of post-operative pain prophylactic antibiotic routine when indicated by a debilitated or chesty patient upper abdominal operation or swallowing difficulty frequent change of decubitus

The *services of a skilled physiotherapist* should be availed of for comprehensive mu cular movements forcible percus sion over the lung bases and coughing exercises the wound if abdominal being supported by the hands

Bronchoscopic aspiration of tenacious bronchial secretion is helpful in severe cases

Pulmonary Tuberculosis

The aims of treatment are

To improve nutrition and increase resistance

To destroy the tubercle bacillus and its toxic products

To promote resolution and healing of lesions

To alleviate symptoms

Measures which increase resistance include fresh air nourishing food in liberal quantities and a judicious admixture of rest and exercise A stay at a sanatorium benefits every con umptive not only from a therapeutic standpoint but for the inculcation of safe hygienic principles

The regimen is much more important than climate or situation and there is much to be said for allowing the patient to work out his physical salvation in an institution close to his home. Febrile or toxæmic patients should never be allowed to journey to a distant sanatorium. Chronic fibroid cases require no treatment; they should be kept under supervision and if invalidism supervenes be nursed in hospital.

Phthisical subjects should live as far as possible in the open air, and those confined to bed may be wheeled on to sheltered balconies. Exposure to sunlight must be very gradual, otherwise reaction and hæmoptysis may ensue. Pyrexia, rapid pulse rate and elevated erythrocyte sedimentation rate are indications of toxæmia and are met by absolute rest in bed. When these have subsided the patient then embarks on a carefully graduated course of physical activity. The first concession is being allowed to sit up in bed and feed himself and later to perform the toilet. When fever has been absent for two or three weeks sitting out of bed for half an hour is permitted, and this is gradually increased according to circumstances. When he has reached the stage of being up and moving about for eight hours, gentle exercise in the shape of a measured walk on the level is ordered, and by suitable augmentations he is rehabilitated to six hours of strenuous work such as gardening, timber cutting and agricultural work daily. The pulse and temperature reaction to each grade of exercise is noted, and any sign of intolerance is an indication for temporary rest, followed by relegation to a lower grade of activity. In view of the strain on sanatorium accommodation the preliminary bed rest must often be arranged in the patient's home.

In an illness of indefinite duration like tuberculosis mental stagnation must be discountenanced. Diversional therapy is begun at the stage of bed rest; occupational therapy, craft work and later scholastic, technological and social activities form an essential part of long term treatment. By these means the patient may leave the sanatorium a more valuable economic unit than he entered it.

An appetising and nutritious dietary should be given. There is rarely any difficulty in persuading tuberculous patients to eat when they are living in the open air. Steady

gain in weight and reversion to normal sedimentation rate are indications of good progress Hypochromic anæmia is common and should be treated with iron Fish liver oils are useful in undernourished subjects provided that appetite and digestion are satisfactory

Chemotherapy

Streptomycin The advent of this antibiotic has in fair measure realised the hope often confounded of a substance which would suppress tuberculous infection Since its introduction to clinical practice acute miliary tuberculosis has been moved from the hopeless to the curable category Streptomycin influences favourably recent exudative lesions but the effect on fibro-caseous lesions is slight

There are two important limitations to the efficacy of streptomycin namely the rapidity with which most strains of *Myco tuberculosis* develop resistance and the toxic effects The latter appear after heavy and prolonged dosage and usually during or shortly after completion of treatment The vestibular irritation is often temporary but in any case compensation is achieved in time Deafness is likely to be permanent

Drug resistance can be delayed or prevented by combining streptomycin with *para* aminosalicylic acid and isoniazid. The adult dosage of streptomycin sulphate is 1 G daily intramuscularly *for up to three months* if *more prolonged therapy* is necessary the interval between doses may be increased *e g* 2 G twice weekly Dosage for children 15 mg per kg body weight

There is some evidence that smaller doses of streptomycin (in conjunction with PAS) are equally effective 0 5 G daily or even 1 G every third day has been found satisfactory in all but relapsed cases The present tendency is to extend *antibiotic treatment over twelve* to eighteen months according to progress

***Para* aminosalicylic acid (PAS)** Used alone this drug has some value in human infections but in combination with streptomycin it has been proved to reduce the factor of resistance to both agents and there is believed to be an additive effect Resistance to PAS develops but slowly and

it is active against many strains which are streptomycin resistant. Adult dosage is 15 20 G daily orally in three divided doses Dosage for children is 1 G per kg body weight daily Nausea vomiting and diarrhœa occur in over 50 per cent of cases these may be mitigated by rearranging the doses in relation to meal or by using milk or aluminium hydroxide as vehicle Rare toxic manifestation are hypoprothrombinæmia anæmia fever psychoses and skin rashes

Thiosemicarbazones Their action is comparable with that of PAS and they are popular in Continental clinics The adult dose of Thiacetazone B P C (Berculon I C I) is 100-200 mg daily by mouth Toxic hazards are agranulocytosis and fatty hepatoses

Isoniazid (Isonicotinic acid hydrazide) Attention was first drawn to its value in human tuberculosis by Selikoff and Robitzer (1952) This drug initiates dramatic improvement in the general condition Appetite and weight increase pyrexia and toxic manifestations lessen and the bacterial count of sputum is lowered Unfortunately the clinical and radiological findings and E.S R. are little altered The organism acquires resistance within three to six weeks and the real rôle of isoniazid is as adjuvant to streptomycin The adult dose is 100 mg orally twice daily Children 3 mg per kg body weight

There appears to be little advantage as between the combinations of streptomycin with PAS and with isoniazid Isoniazid is a comparatively recent addition to the therapeutics of tuberculosis and its long term possibilities are still uncertain Relative freedom from toxicity renders it a useful substitute for patients who cannot tolerate PAS in adequate dosage or where the organism has become resistant J G Scadding (1955) regards PAS-INH as the best combination for out patient treatment especially in older age groups In serious infections all three are given together

Duration of treatment depends on the nature of the case and the response as judged by clinical and radiological findings A good chemotherapeutic scheme is

1 Streptomycin daily for forty five days and subsequently every third day for another 15 injections (ninety days) combined with PAS daily

2 Second course of streptomycin after an interval of two to four weeks PAS and INH daily for a further 90 120 days

3 A third course of streptomycin is given in most cases —over thirty days and subsequently every third day for another 30 injections (120 days) combined with INH daily

Chemotherapy is a valuable resource for quieting down the activity of recent cases who are clinically ill and toxic *It reinforces the good effect of conventional methods of* treatment but is not a substitute for them Miliary pneumonic and soft exudative lesions also laryngeal and tracheobronchial ulceration respond best. Chemotherapy is of great value in cases likely to become suitable for surgical methods but it must be available as cover for the operative phase if used prematurely the infecting organism may be resistant when protection is most necessary

Surgical Treatment

Collapse therapy The object is to place the affected portion of lung at rest thus encouraging fibrosis and collapse of cavities this may be achieved temporarily by induction of pneumothorax or pneumoperitoneum or permanently by thoracoplasty

Artificial pneumothorax The advent of effective chemotherapy and radical surgical measures has narrowed considerably the indications for pneumothorax treatment It is no longer a first resort in early exudative cases but a second or third line of defence Its main indication is for closure of small or medium sized soft walled cavities in sputum positive cases Ideally the cavities should not be peripherally situated and should have a free bronchus Also suitable for pneumothorax treatment are young adults showing good natural resistance rather than children or middle aged adults Fibrotic disease large cavities pleural adhesions poor resistance with fever and raised E S R and endobronchial lesions are contra indications for pneumothorax Satisfactory collap e should accrue within a period of four to six weeks A pneumothorax which hangs fire requires positive pressures or is complicated by persistent pleural effusion is unsafe and should be abandoned in favour of other measures

In a successful case the pneumothorax is maintained for 1½-3 years there is no absolute indication as to when it may safely be terminated and the d cision is usually made on clinical progress i e cavity obliteration sputum conversion

Artificial pneumoperitoneum More frequently practised than pneumothorax as it is less liabl to a complicated course It has considerably wider appl cation and in conjunction with phrenic crush induces effective collapse It is useful during the chemotherapeutic phase of early cases and as it requires only modest technical resources it can be incor porated in the pre sanatorium regime It is also helpful in cases where pneumothorax has failed or would be likely to fail such as extensive caseo-cavernous lesions widespread pleural adhesion and recurrent pleural exudate It is a useful temporary measure for patients who will require definitive surg cal measures such as thoracoplasty or resection It should not be used in cases with extensive fibrosis or with tuberculous abdominal lesions Abdominal hernia is a contra indication

Phrenic crush Produces temporary paralysis and ascent of the hemi diaphragm and is used mainly as auxiliary to pneumoperitoneum Recent phrenic crush adds to the hazards of lung resection because of the increased risk of massive collapse

Extrapleural pneumothorax Designed for cases where adequate intrapleural space cannot be found The parietal pleura and the affected lobe are freed from the inner surface of the thoracic wall in the plane of the endothoracic fascia *Plombage* with polythene sponge has proved a successful modification. Extraperios eal fascial apicolysis with *plombage* gives better results and has ousted thoracoplasty in some clinics These procedures give good selective collapse and are used for api al cavities Being one stage opera tions and causing no thoracic deformity they are popular with patients

Thoracoplasty Secures permanent collapse in cases not suitable for other surgical procedures This is the safest major surgical project provided that patients are carefully selected Best results are obtainable in upper lobe cavities but cavities in other ituations are often closable It is also indicated for obliteration of pleural cavi ies following

empyema or pneumothorax it may be necessary in con junction with resection operations to reduce the dead space Thoracoplasty is not useful in cases with extensive bronchial involvement and large tension cavities nor in massive con solidative foci or mainly basal lesions Elderly obese and emphysematous subjects stand the operation badly and derive no benefit The operation is a two-stage one the upper 5 7 ribs being removed and the lung apex freed by extrapleural apicolysis

Lung resection Chemotherapy has greatly widened the possibilities for operations of this type and radical surgery bids fair to eclipse other techniques

Indications

Extensive unilateral disease with or without controlled contralateral lesions

Large tension cavities particularly in the lower lobes

Bronchial stricture bronchiectasis

Massive caseous involvement (tuberculoma)

Recurrent hæmoptysis from apical cavity

Children and adolescents where deforming operations are inadvisable

Contra indications

Streptomycin resistant cases

Extrapulmonary lesions

Poor vital capacity

Active endobronchial lesions

The operation may have the extent of segmental or wedge resection lobectomy or pneumonectomy according to anatomical involvement Complications are bronchial fistula and empyema

Symptomatic treatment For cough a warm saline draught on waking facilitates expectoration Irritating and useless cough may disturb sleep and is best controlled by a sedative *e g* pholcodine 8 12 mg in Simple Linctus B P C The sufferer must acquire the art of coughing gently Postural drainage is helpful in many cases Night sweats are a sign of toxæmia and are lessened by rest in bed fresh air and attention to skin hygiene Anorexia arises from the same

cause and similar general measures should be invoked Bitter tonics or a pre prandial aperitif are useful aids to appetite

For laryngeal ulceration complete rest of the voice is desirable at first and the patient should communicate in mime or writing When the condition has improved he may be allowed to converse in whispers Aromatic inhalations such as Menthol and Eucalyptus Inhalation, B P C from a Yeo s mask are soothing and reduce cough

Lactic acid or Lake s paint may be applied to the laryngeal ulcers and cautery is used in more advanced cases If swallowing is difficult insufflation of a powder composed of equal parts of benzocaine and orthocaine before meals will reduce laryngeal irritation Chemotherapy lessens the discomfort of ulcerative lesions even in presence of hopeless pulmonary involvement

Tuberculous enteritis should be treated by rest in bed high-calorie low residue diet and astringent mixtures Helio- and ultra violet therapy are sometimes beneficial but they must be employed with caution Streptomycin has been found helpful but its administration should be systemic rather than local Ischiorectal abscess and fistula in ano occasion serious discomfort and debility and radical surgical treatment should be advised in all but hopeless cases For genito-urinary involvement the general principles of treatment apply and they should be supplemented by appropriate surgical measures

Hæmoptysis. Complete rest in bed (prone and with the foot raised) and reassurance are important Morphine gr $\frac{1}{6}$-$\frac{1}{4}$ should be injected to calm the patient and stabilise the circulation Food should be limited to cold fluids for twenty four hours Styptics and hæmostatic sera are of no value but blood transfusion may be necessary following severe bleeding. Artificial pneumothorax is occasionally required to induce relaxation of a bleeding lung but pneumoperitoneum (1,200-1 500 ml) is a safer alternative Lung resection should be considered for recurrent hæmoptysis

Spontaneous pneumothorax If small calls for no special treatment Extensive valvular types produce grave respiratory embarrassment and the intrapleural pressure must be

reduced to atmospheric This may be done by needling using a water seal Negative pressure methods are unwise

Prophylaxis

Detection of infected persons in the early stages Mass miniature radiography has proved of inestimable service in case finding Notification of cases and intimation of suspects Disinfection of premises and clothing Hygienic disposal of sputum

Isolation of all open cases Sometimes difficult particularly in chronic fibrotic cases Economic stress may militate against the individual s chance of prolonged cure Entitlement to allowances under the National Assistance Acts is a notable step and the provisions of the Disabled Persons Employment Act are of great assistance in the economic rehabilitation of tuberculous wage-earners

Sanatorium treatment for all cases likely to benefit with *efficient after-care The self supporting colony system e g* Papworth Village Settlement is a practical solution of the economic problem Here patients lead normal and productive lives together with their families In such carefully controlled environment the risk to children of infected families is minimal

Provision of training hostels night sanatoria and supervision of chronic cases

Clinical supervision of contacts particularly young children with preventorium treatment when necessary *Miniature radiography is useful for screening large numbers* of contacts suspects are afterwards subjected to full clinical and radiological examination Routine Mantoux testing of child contacts indicates those already infected Adult and elderly members of an infected household should not be excluded from the investigation

Bacille Calmette-Guérin (B C G) This preventive measure has gained world wide acceptance Intradermal inoculation by multiple puncture of a live avirulent strain of *Myco tuberculosis* (bovine) in tuberculin negative subjects will provoke *immunity and conversion of the tuberculin reaction* thus increasing resistance to infection with virulent organisms Conversion is expected six to eight weeks after inoculation Recently vaccinated subjects should be protected from

natural infection for at least three months The duration of the resi tance so induced has rot yet been determined but it may last ten years Attenuation of the vaccine is secured by cultural methods and one of the practical difficulties is to maintain a vaccine output of optimal virul nce Liquid vaccines must be used within a week of manufacture but freeze-dried preparations are free from this disadvantage A Medical Research Council Committee reported that these induce almost as high a percentage of tuberculin sensitivity as the older vaccines but the ob ervation period has been short

Infants are vaccinated within a few days of b rth and if belonging to infected homes they a e segregated until basal immunity has been established (usually two to three months) Mantoux negative girls sh ould be vaccinated at the age of 10 years on account of the risk of post primary genital tuberculosis at puberty with subsequent sterility

B C G has spe ial applicability in tuberculin negative reactors who are exposed to unusual risks of infection if children of tuberculous parents nurses and medical students

Tuberculosis and occupation Unless he has used the enforced leisure to fit himself for a better post economic n cessity will frequently compel the consumptive to return to his former occupation however unsuitabl Open air occupations are best provided they do not involve strenuous physical exertion or exposure to damp and cold Open cases should not return to occupations in which they are liable to infect fellow workers nursing teaching and food handling are particularly dangerous

The need for prolonged medical supervision should be impressed upon the patient

Tuberculosis and marriage There is no contra indication to marriage in the case of genuinely arrested tuberculosis Other cases must be judged according to circumstances. The risk of infection of the healthy partner and of further breakdown and invalidism of the infected partner should be explained to both Against these risks must be offset the manifold advantages of set led home life

Tuberculosis and pregnancy Women with active tuber culous lesions should in general avoid pregnancy a though

the risk of rapid deterioration following delivery has been exaggerated

In tuberculous women who are pregnant management depends upon whether the lesions are likely to be controllable if so treatment as outlined above is a matter of urgency The only modification would be that major surgery should not be attempted during the last trimester Therapeutic abortion may be indicated in wholly unpromising cases but it should be undertaken within the first twelve weeks of pregnancy In quiescent cases pregnancy is usually uneventful provided that reasonable precautions are taken

A decision regarding breast feeding must depend on individual circumstances If the tuberculosis has been quiescent for two years and the domestic situation is good there is no objection If home conditions are poor and the mother s responsibilities numerous or if she is receiving pneumo-collapse therapy lactation is unwise

The infant should receive B C G vaccination

Sarcoidosis

The relationship of this condition to tuberculosis is obscure many patients fail to react to tuberculin although some develop tuberculosis eventually

Epithelial cell granulomata occur in the liver lungs lymph glands skin and small bones of the hands and feet Myocardial and renal involvement are not uncommon A similar pulmonary fibrotic picture occurs in berylliosis and histoplasmosis

Prednisone is indicated where the disease is rapidly progressive and may have to be given indefinitely As infection with tubercle bacillus may also be present it is essential that antituberculous therapy be given at the same time

Pulmonary Fibrosis and Pneumoconiosis

The former designation includes many different types of lesion such as fibrosis following bronchopneumonia or chronic pulmonary infections the latter is associated with inhalation of irritant dusts

Fibrosis following infection is treated on the lines indicated for chronic bronchitis For pneumoconiosis exposure to the

irritant atmosphere should cease A quiet open air life in a dry equable climate is beneficial and all measures likely to improve nutrition should be adopted Symptomatic treatment as for chronic bronchitis emphysema and cor pulmonale should be given Severe dyspnœa and bronchospasm are relieved by prednisone 30 mg daily and gradually reduced to 5 15 mg.

Prophylaxis of pneumoconiosis consists of regular radiological examination of those at risk with exclusion of employees showing even slight signs or symptoms of pulmonary disease Certain precautions are enforced e g provision of respirators efficient local exhaust ventilation wet drilling and grinding.

Silicosis Silica is the noxious agent common to gold and anthracite mining sandblasting, asbestos handling and certain processes relating to iron production Silicosis is frequently associated with tuberculosis and the disability may be progressive after the dust factor has ceased to operate

On inhalation silica particles are carried into the tissue spaces of the lung stroma by dust cells Here a silica colloid is formed which is toxic to pulmonary tissue Experimentally a finely particulate aluminium inhalation or one charged with a solution of calcium coats the silica crystals with a protective layer of hydrated alumina or lime which inhibits fibrotic reaction to quartz. These methods have not proved acceptable in practice

Intrathoracic Neoplasm

Benign tumours and cysts arising from nerves ribs pleura mediastinal tissues or bronchi can be removed surgically Bronchial carcinoma is by far the commonest intrathoracic tumour Early diagnosis is important as pneumonectomy with lymphatic dissection may be curative in suitable cases Radiotherapy is used as auxiliary to surgical extirpation or as a palliative in inoperable cases.

Pain and cough are usually troublesome and call for analgesics or sedation with pholcodine morphine pethidine or dihydrocodeine bitartrate (DF 118 dose 30-50 mg subcutaneously 30 mg. orally) Pleural effusion should be

aspirated air replacement is sometimes of service in management of recurrent effusion

Pleurisy

Dry pleurisy should be treated by rest in bed and light diet Pleural pain is usually prominent at the outset and may be lessened by strapping the affected hemithorax Heat in the form of kaolin poultices or short wave diathermy is preferable in many cases For irritating and painful cough a sedative linctus may be employed

In the stage of effusion treatment is directed to promotion of absorption of the exudate and re-expansion of the affected lung. Diet may be increased as the fever moderates and tonics of iron and vitamins are valuable Rest should be continued and in the open air if possible for three to six weeks after pulse temperature and E S R have regained normal Deep-breathing exercises and Woulfe s bottles are useful for promoting re-expansion of the collapsed lung A diagnostic paracentesis is desirable as the information thus obtained will be helpful in designing further treatment

Small and moderate effusions often absorb spontaneously but aspiration is necessary in the following circumstances

1 The effusion is large or accumulating rapidly causing respiratory difficulty

2 There is no evidence of absorption after two to three weeks

3 The effusion is bilateral

4 The effusion is purulent

5 The effusion complicates an active tuberculous l sion (artificial pneumothorax may be indicated)

In the first and second groups removal of 10-15 oz of liquid will often relieve symptoms and initiate spontaneous absorption Complete evacuation of the exudate will be necessary later if absorption is tardy or reaccumulation occurs Unduly rapid removal of large amounts of fluid is contra indicated on account of the danger of media tinal shift and premature aspiration appears to encourage further exudate

The ætiological basis of the pleurisy must be taken into account when elaborating further treatment Those complicating acute lung infections require treatment of the primary condition About 30 per cent of idiopathic pleurisy cases subsequently develop pulmonary tuberculosis and it must be assumed that those occurring in young persons are of tuberculous origin Some settle only after a course of anti tuberculous drugs Radiography of the expanding lung may demonstrate an active focus and such cases should have prompt sanatorium treatment Others should be treated as suspect tuberculosis and given a prolonged holiday with nourishing food and vitamin preparations Regular clinical and radiological supervision should be available for five years

Empyema

Usually secondary to inflammatory lung disease and the primary condition should have appropriate treatment Bacteriological diagnosis will furnish indications regarding appropriate chemotherapeutic measures Systematic penicillin is valuable at the outset of most pneumococcal streptococcal and staphylococcal infections of the pleura The effusion should be aspirated daily or every two days and 500 000 units of penicillin in 15 30 ml of sterile saline injected until bacteriological findings become satisfactory Streptomycin (150-200 mg) may be similarly used in the presence of organisms sensitive to this drug although its bacteriostatic effect in pus is inferior to that of penicillin The broad spectrum antibiotics should be administered systemically when particularly indicated

Medical treatment of empyema although rarely adequate alone is a desirable preliminary to surgical drainage and toilet of the pleura If the empyema is encysted or localised to a lung fissure aspiration may be difficult and early drainage is required Pus of a non aspirable consistency is an indication for several daily or alternate daily injections of streptokinase streptodornase intrapleurally These enzymes liquefy fibrin clot and thick pus and are used in doses of 20 000 and 5 000 units respectively Decortication is indicated when the lung is bound down by a thick fibrinous covering

Pyopneumothorax usually results from drainage of an empyema through a bronchus or rupture of a lung abscess Pleural fistula may follow empyema necessitatis For these prompt surgical treatment is necessary

Pneumothorax

When associated with a penetrating chest wound requires treatment of shock Later removal of foreign bodies blood clot and lacerated tissues should be followed by careful repair of the chest wall and finally aspiration of imprisoned air Penicillin by local and general administration is an invaluable auxiliary to the surgery of chest wound

Spontaneous pneumothorax may appear in apparently healthy chests and in the absence of any exciting cause such as physical exertion Non tuberculous pneumothorax is often due to rupture of an emphysematous bulla or pulmonary cyst The condition tends to recur and in a small proportion of cases pulmonary re-expansion is delayed

If the effusion of air is small rest in bed and the administration of an anodyne will be sufficient Valvular types cause mediastinal shift and great respiratory distress the air should be allowed to escape through a chest needle connected to a rubber tube the free end of which is immersed in water thus limiting the intrapleural pressure to atmospheric This may be dispensed with as soon as the rent in the lung has become sealed

Recurrent cases should be investigated by bronchography and thoracoscopy as treatment depends on the cause A cystic condition calls for localised excision or lobectomy emphysematous cases with a free pleura are submitted to pleurodesi (*instillation of silver nitrate 5 10 minims of 10* per cent solution intrapleurally)

Spontaneous pneumothorax may complicate pulmonary diseases notably tuberculosis (see p 279)

Congenital Cystic Disease of the Lung

May communicate with a bronchus or rarely be non communicating The latter is symptomless unless rupture occurs The former may show a solitary cyst a cluster of *small cysts or a large balloon cyst Symptoms may be*

absent or dyspnœa may be a feature Hæmoptysis spontaneous pneumothorax and infective complications such as lung abscess bronchiectasis or empyema are liable to supervene

The balloon cyst is caused by the check valve action of a bronchial kink and may give rise to urgent respiratory distress which is temporarily relieved by needling There is danger of development of tension pneumothorax after needling and surgical resources for this emergency must be at hand Resection of the cyst or lobectomy is the only satisfactory measure The complications mentioned above call for appropriate remedies

Treatment is otherwise concerned with maintenance of general health and careful attention to upper respiratory infections

CHAPTER XV

DISEASES OF THE NERVOUS SYSTEM

Peripheral Nerve Lesions

Localised lesions of peripheral nerve trunks may rise from direct trauma compression or from traction injury Medical treatment is directed to maintaining the nutrition of the weakened muscles and preventing contracture and de formity These principles are secured by application of suitable splintage and this should be easily removable to permit the use of physiotherapy Massage and full move ments of the affected limb are given daily Electrotherapy is useful when signs of nerve regeneration appear

If no improvement results after a period of several months surgical treatment must be considered Exploration of the affected nerve trunk and freeing it from scar tissue or if continuity is interrupted restoration by suture are useful

Russell Brain and Dickson Wright have described a syndrome due to spontaneous compression of the median nerve in the carpal tunnel and characterised by wasting of the thenar eminence weakness of the abductor pollicis brevis and opponens pollicis and sensory changes of median distribution Surgical division of the anterior carpal ligament is curative

Multiple Neuritis Peripheral Neuropathy

The classical type arising from toxic state or nutritional defect shows symmetrical and peripheral distribution with *considerable subjective sensory upset After removal of the* cause the paresis and trophic disturbance are usually reversible Characteristic muscle group involvement dis tinguishes other specific entities like diphtheria leprosy plumbism and the collagen diseases

General management consists primarily of dealing with the cause or the underlying disease Lead poisoning responds

well to treatment with sodium calciumedetate (see p 87) while gold and arsenical toxicity improves with BAL therapy (see p 330) Thiamine deficiency arises through deprivation or more usually from alcoholism where the deficiency is associated with inhibition of the pyruvate oxidase system and high blood pyruvate levels Thiamine 20-30 mg daily intravenously at first is useful only within its narrow indication, and neuropathy due to lewisite ar enic and other metals is not improved by vitamin B dosage

Polyneuropathy a sociat d with carcinomatosis and porphyria has no specific remedy but should be treated on general principles that found in Addisonian anæmia improves *pari passu* with the hæmatological response to cyanocobalamin Diabetic neuritis is an indication for careful stabilisation of the metabolic condition

Bed rest is essential until the attack has spent itself and regression appears Nouri hing dietary fresh air cheerful surroundings and diversional therapy are very de irabl Anæmia should be corrected and anodynes like aspirin codeine or Dover s powder prescribed for relief of pain especially night pain Chlorpromazine (Largactil M & B) is useful in the early stages in do_age of 25 50 mg by mouth twice or thrice daily Corti otrophin and the steroid hor mones give good results in some cases particularly where the neuropathy is severe and extensive in th se there is pre sumably an allergic factor or gross toxic basis

Local treatment That of muscular paralysis in general Affected limbs are placed in a position of physiological rest and light splintage sandbags and bed cradles should be employed Heat as infra red radiation or hot stupes is soothing and relieves pain allowing a full range of passive movements to be done daily Later light massage and assisted voluntary movements are introduced, graduating to movements against resistance The use of a warm bath or whirlpool improves the blood supply and makes all muscle movements easier Re-educational exercises help to regain lost skills

Various types of neuropathy with emphasis on sensory disturbance have been described *e g* Refsum s syndrome H Garland (1950) has reported cases with motor loss

suggestive of spinal cord involvement and cerebral neuropathy due to vitamin B_{12} lack has recently been recorded

Acute febrile polyneuritis (Guillain-Barré syndrome) There is usually a history of an acute febrile illness followed by parasthesiæ and muscular weakness which beginning in the lower limbs spread upwards to involve the trunk musculature and the cranial nerves facial and bulbar palsies and diplopia are especially common This rapidly ascending palsy of Landry type may simulate poliomyelitis and acute porphyria may present a similar clinical picture There is no specific treatment Bladder distension calls for catheterisation and if persistent for continuous catheterisation or tidal drainage Should respiratory failure threaten the *patient must be placed in a mechanical respirator* the airway kept clear and oxygen inhalations given Palatal weakness or difficulty in swallowing is an indication for tube feeding Prednisone by mouth (60 40 and 20 mg on the first to third days and then tapered) is of value during the acute stage Hyperkalæmia occurs from muscular tissue breakdown and should be corrected Local treatment is as described above

Neuritis

Sciatica and brachial neuritis were formerly thought to be caused by acute interstitial neuritis or primary inflammation of the nerve coverings with secondary involvement of the parenchyma The great majority of such cases are due to protrusion of the nucleus pulposus of an intervertebral disc giving rise to direct pressure on the nerve root Interstitial neuritis is seen in leprosy as an occasional manifestation of rheumatic disease or as the result of a nerve being involved in an area of sepsis It may also arise from compression or repeated minor trauma *e g* radial palsy external popliteal paralysis

Localised neuritis of the shoulder girdle Severe pains in the affected shoulder usually herald the atrophic paralysis which affects most commonly the serratus anterior spinati deltoid and biceps About one half of the cases are found in patients hospitalised for some other disease some cases develop spontaneously but in others there may be a recent

history of pneumonia surgical operation or blood transfusion circumstances which suggest a virus origin The condition resembles closely the neuritis which may follow the injection of serum *e g* antitetanic antidiphtheritic The long term prognosis is good although recurrence has been noted

For the severe initial pains aspirin alone or in combination with phenacetin and codeine should be given With the appearance of paralysis the arm should be supported by a splint so that the affected muscles are in physiological rest the splint is removed daily for full passive movements When the acute phase has subsided daily massage galvanic stimulation and later active movements and exercises are given until there is recovery of voluntary power

Brachial neuritis Often attributed to sitting in a draught or excessive muscular exertion In many cases the application of radiant heat followed by vigorous massage of the stiff and painful muscles may suffice to bring about a cure When the pain persists or recurs the cervical spine should be radiographed In a high proportion of cases especially the middle aged and elderly there is evidence of osteoarthritis or of prolapse of an intervertebral disc The sixth cervical disc is commonly involved causing irritation of the seventh cervical root

The most effective treatment in such cases is absolute rest in bed for three weeks The head should be supported on one or two pillows with the patient recumbent and fully relaxed Aspirin phenacetin and codeine are required at first for the pain but as a rule this quickly disappears Mephenesin (Myanesin elixir B D H) in doses of one drachm four times daily is sometimes useful in promoting muscular relaxation. When pain subsides passive movements of the neck and gentle massage should be given When allowed up the patient should be advised to return gradually to normal activities and for a time to rest supine for an hour each day In some cases especially when pain has recurred it may be advisable to order a collar of plastic or leather to be worn for some months Surgical treatment by decompression of the affected nerve root or excision of the prolapsed disc is rarely necessary except in cases of high cervical disc prolapse

Cervical rib *Many are symptomless and discovered* accidentally Operative treatment should be considered in cases showing signs of recurrent vascular symptoms or neurological disturbance with pain muscle wasting or sensory loss in the ulnar distribution Various types of abnormality are encountered and the compressing surface whether a seventh cervical rib normal or rudimentary first dorsal rib a fibrous tissue attachment or an abnormal scalenus should be removed The operation of division of the scalenus anticus is reputed to relieve pain by allowing the first rib to drop but its main indication is compression of the subclavian artery Mild cases should be treated by splinting the arm at a right angle to the trunk Exercises to set up the shoulder girdle and to strengthen the trapezius are of value as they are also in many pregnant or middle aged women complaining of intractable pain with drooping of the shoulder girdle on the affected side Shoulder dragging as in carrying heavy weights should be avoided

Sciatica A generic term which includes the much disputed primary sciatic neuritis and lesions which are compressive in type

Organic disease of other systems must be excluded *e g diabetes Pott s disease Pelvic examination should* be done to exclude the presence of neoplasm Radiography of the spine and pelvis will reveal the presence of spondylitis spondylo listhesis sacro-iliac joint affection or malignant metastasis Spinal root pressure from an intervertebral disc lesion is the commonest cause of sciatica The discs degenerate in middle age and slight trauma in the shape of a heavy lift with the spine flexed will cause rupture of the annulus and posterior or lateral protrusion of the nucleus pulposus All the neuro logical signs formerly attributed to sciatic neuritis such as pain on stretching the nerve loss of ankle jerk sensory impairment and muscular wasting are reproduced by disc lesions The most commonly protruded disc is L5—S1 (1st sacral root) L4-5 (5th lumbar root) is next in order of frequency but lesions of the 2nd and 3rd lumbar disc also occur O Connell has associated maternal obstetrical paraly sis with rupture of the 5th lumbar disc and compression of the cauda equina

The most important ingredient of treatment in sciatica is complete rest in bed This is maintained until pain and tenderness of the nerve trunk have disappeared The patient should be kept comfortably warm and encouraged to assume th position of greatest ease the affected limb being supported by pillows Aspirin with codeine phenacetin or phenobarbitone is usually effective Panadol Bayer and Proponesin B D H are useful proprietary alternatives dosage up to 8 tablets daily The local application of heat is soothing *e g* well protected hot water bottles hot stupes radiant heat lamp Myanesin may help muscular relaxation as recommended in page 291

The patient should not be allowed up until he has been free of pain for some time and it is important at this stage to massage the muscles and to give active exercises in standing and walking so as to correct any faulty postural tendencies When pain has been very severe and prolonged and there have been previous attacks it is advisable to follow up the rest period by a term in a well fitting plastic jacket which is worn for some months and renewed when it works loose Spinal manipulation stretching the nerve under anæsthesia and epidural injection have fallen out of favour

Surgical treatment in the form of excision of the herniated disc is indicated when there are definite signs of nerve root irritation or compression pain persists in spite of rest or when it recurs after an adequate trial of conservative measures As might be expected in such a tedious and painful malady the results are not uniformly successful Even when before operation the signs have been unequivocal pain may recur when the patient undertakes undue physical exertion but in many cases there is gratifying relief after operation Psychological factors should be considered, although the mistake must not be made of allowing the intensity of a patient s emotional reaction to severe pain to deter one from advising operation when this is clearly indicated Great caution is however necessary in reaching this decision in cases in which there are hysterical features or where there is a history of industrial injury and the question of compensation arises

Referred sciatic pain is sometimes a symptom of severe lumbar fibrositis (myofascial sciatica) treatment is as for lumbago (p 334) Osteoarthritis of the hip joint and lumbosacral or sacro-iliac strain often cause symptoms which are mistaken for sciatica Joint strain may be relieved by mechanical support, as by carefully fitted belt or corset

Anterior crural (femoral) neuritis Usually a symptom of lumbar spondylosis or nuclear herniation but occasionally the nerve trunk becomes involved in a local inflammatory process Symptomatic treatment is as for sciatica

Paraplegia

Treatment depends on whether the onset of paraplegia has been recent and acute or slowly progressive

Acute paraplegia This may be due to myelitis complicating such virus diseases as measles smallpox and vaccinia or disseminated sclerosis and neuromyelitis optica Acute necrotic changes in the cord may result from syphilitic endarteritis or obstruction of vessels in the epidural space by new growth or abscess The recognition of the latter at an early stage is of special importance for if operation is delayed until signs of paraplegia have appeared prospects of recovery of function are poor Paraplegia may develop rapidly in spinal caries In the absence of knowledge regarding the cause treatment in acute myelitis is symptomatic

Distension of the urinary bladder must not be permitted Retention with overflow is usual at first but in favourable cases some degree of automatic control is gained Bladder contractions may be reflexly stimulated by stroking the soles of the feet or it may be possible to express urine by gentle manual compression of the bladder through the abdominal wall Usually regular catheterisation or tidal drainage by a self retaining catheter is necessary Cystitis should be combated by free intake of fluids and trisulphonamide tablets or a suitable antibiotic When there is accumulation of pus bladder washes using weak antiseptics such as boric acid or 0 1 per cent acriflavine are required Prolonged recumbency and infection both favour calculus formation Frequent changes of posture abundant fluid intake and an acid ash diet are indicated

As regards care of the bowels once a week a soap and water enema should be given followed the same evening by an aperient This inevitably leads to soiling of the skin and bed the next day but when satisfactory evacuation is attained the bowels require little attention for the rest of the week. Thus frequent skin contamination is avoided. Abdominal distension due to gaseous accumulation (when not due to impaction of fæces in the rectum) is relieved by the hypodermic injection of 0 5 mg neostigmine methyl sulphate

Careful nursing to keep the undersheet free of creases the skin clean and dry and frequent changes of posture are essential An alternating pressure point mattress (Tatley) is useful in preventing decubitus sores in helpless patients These measures alone often fail to prevent pressure sores in high spinal cord lesions (above T6) where there is absolute loss of all functioning below that level Vasomotor paralysis of the superficial vessels supplying the skin probably explains the rapidity with which pressure sores can develop through initial small areas of necrosis the result of ischæmia In such cases the patient s position must be changed very frequently and it is not sufficient to turn him only from side to side For the greater part of the time he should be raised in the supine posture on a spinal bed built up with layers of extra pillows for convenience Nursing in this fashion becomes all the more essential once pressure sores have formed over the sacrum and other sites After preliminary saline soaks penicillin-sulphadiazine powder should be applied under a plain dressing such as soft paraffin gauze and the pressure sore then sealed off by the application of a wide strip of elastic adhesive The hæmoglobin and plasma protein levels must be watched and repeated transfusions of whole fresh blood oral administration of 400 mg ascorbic acid daily and a diet rich in protein (100-150 G daily) are the best means of securing rapid healing of indolent chronically infected sores Testosterone propionate 25 mg by muscle at five-day intervals or androstanolone Anabolex Lloyd Hamol 2 3 25 mg. Tablets sublingually daily will encourage nitrogen retention When sepsis has been overcom skin grafting may be desirable to speed healing

As regards posture of the paralysed limbs the knee joints should be kept extended and the ankles dorsiflexed any tendency to outward rotation of the limbs being checked Daily passive movements through a complete range at each joint are required and light massage should be given to hypotonic muscles The upper limbs when paralysed should be rested in a position of extension at the elbow joints and wrists Any tendency to flexion contraction of the fingers should be counteracted by the use of sponge rubber fixed in position in the palm of the hand

Chronic paraplegia Although in paraplegia of acute onset signs of total loss of spinal cord function may persist it is usual to find some recovery of vasomotor tone Thus even with high thoracic lesions after a time the patient can sit up without fainting The usual nursing precautions will then be sufficient to prevent pressure sores even though sensation is still defective The patient may be taught to balance himself sitting upright by utilising muscle above the level of the lesion *e g* latissimus dorsi and suitable patients may gradually proceed to walking with the aid of calipers fitted to the legs and elbow crutches

The most difficult problem in chronic paraplegia is spasticity Flexor spasms increasing in strength and frequency herald the development of paraplegia in flexion They are made worse by massage but relieved to some extent by small doses (gr 1) of sodium amylobarbitone or codeine gr ¼ ½ Mephenesin (Myanesin elixir B D H) 1 drachm or quinine sulphate gr 2 3 thrice daily may be tried Nursing the patient on alternate days in the prone and supine positions with cradling is of value but whenever possible attempts should be made to get the patient to stand When the upper limbs are unaffected this may be done by placing him between parallel bars situated at hand level and encouraging him to keep the legs extended whilst at the same time he distributes his weight between the arms and legs When sensation is little impaired these exercises may be undertaken under water in a deep pool bath the patient supporting himself on handrails under the direction of the physiotherapist The walking chair is another useful apparatus for patients afflicted with spasticity Remarkable

rehabilitation may be achieved when the underlying lesion is inactive and has been successfully dealt with *e g* extra medullary spinal cord tumour

Ataxic paraplegia due to the partial cutting off of proprioceptive impulses from disease of the posterior columns may be greatly benefited by the re education exercises of Frankel These are aimed at teaching the patient to control the movements of his limbs under the direction of the eyes by walking beside a handrail and placing the feet as accurately as possible on footprints painted on strips of canvas or rubber

Disseminated Sclerosis

There is no specific treatment the cause underlying the recurring episodes of patchy demyelination being as yet unknown Cloake advocates treatment with the organic arsenicals over a period of several years Histamine is favoured by some for treatment of relatively fresh episodes (1 mg of histamine base in 250 ml of normal saline intravenously rapidly to induce facial flush but no headache) Amyl nitrite inhalations have been used for the same purpose There is no defect in glial formation and no convincing evidence in favour of trace element deficiency *e g* copper cobalt Swank suggests restricting fats and meat and allowing a high carbohydrate diet Care should be taken in all cases of disseminated sclerosis to avoid unnecessary confinement to bed—surgical operations should not be undertaken unless essential Treatment of the paraplegic state is described in page 294

Subacute Combined Degeneration

Treatment is by vitamin B_{12} (cyanocobalamin) as in Addison s anaemia but much larger doses are required. It is not enough to restore the blood picture to normal Intensive treatment should be continued as long as there are signs of improvement in the neurological state The postero-lateral cord changes are irreversible but when an early diagnosis is made the signs to which they give rise will not present any bar to successful rehabilitation on the lines described for chronic paraplegia (see p 296) The dosage of cyanocobalamin should be 1 000 mg by muscle every other day for 6

doses then a similar dose bi weekly for 6 weeks a basal dose of 50-100 mg. weekly or fortnightly may suffice Distivite 3 100 µg tablets daily is reputed equally effective

Syringomyelia

The patient should be warned against the danger of septic infection of the hands and of injury e g burning or scalding Deep x ray treatment to the spinal cord is said to have some effect in retarding glial proliferation but the results are variable and inconclusive occasionally when pain is a prominent symptom it may help Laminectomy with incision of the cord and drainage of a distended cavity has been performed in cases in which the signs point to rapidly increasing compression But these symptoms often subside spontaneously and surgical intervention is seldom justified

Amyotrophic Lateral Sclerosis

In most cases death results within three years from the onset Few patients with bulbar complications survive longer than one year When muscular wasting is limited to the extremities progress may be slow and appear to be arrested for a time There is no specific treatment Bulbar cases require careful spoon feeding with semi solid foods mixed with liquids In advanced cases the only safe way of feeding is through a nasal tube passed into the stomach Dribbling of saliva may be checked by 5 10 minims of tincture of bella donna twice daily or atropine sulphate parenterally if swallowing is difficult

Hereditary Ataxias

Treatment has little effect on the course of these maladies Attention to the general health encouragement of suitable activities and re-educational exercises may help to stave off serious invalidism (See under cerebral palsies) Orthopædic appliances may be worn to overcome the troublesome lower limb deformities

DISEASES OF THE MUSCLES

Muscular Dystrophy

Vitamin E amino-acids and glycine have been used in treatment but the evidence in favour is unconvincing

Periodic rest and massage are helpful, but it is unwise to keep patients in bed for long as this increases disability Deformities of the lower limbs may be corrected for a time by light splints tenotomy or surgical boots The chronic myopathy occasionally seen in association with thyrotoxicosis is said to improve after thyroidectomy

Myotonia In myotonia congenita and to a lesser extent in dystrophia myotonica quinine has a beneficial effect It may be prescribed in doses of gr 10 30 of the hydrobromide daily

Periodic Paralysis

It appears that there is no simple relationship between plasma potassium and muscular paralysis Conn s work showed that attacks of paralysis spontaneous and induced were preceded by increased aldosterone secretion The sodium content of muscle was greatly increased and the potassium unchanged Recovery was associated with massive diuresis and sodium output The cause of the intermittent aldosteronism is uncertain

In the rare familial form the attacks are most severe in youth Characteristically there is flaccid paralysis of the extensor muscles of the limbs on waking and it may be induced by cold, injection of adrenaline the ingestion of glucose or a mainly carbohydrate diet Tetany is sometimes present The serum potassium level is usually drastically reduced during the attack and prevention is by the daily administration of potassium chloride 3 10 G in enteric coated capsules During an attack, if respiration is affected it will be necessary to place the patient in a respirator If he can swallow 1 2 teaspoonfuls (4-8 ml) of 25 per cent. solution of potassium chloride in a flavoured vehicle should be given, otherwise 100 ml. of 1 per cent. solution of potassium chloride should be injected intravenously

Alarming ascending flaccid paralysis may occur in hyperkalaemia which may arise as a complication of chronic nephritis and is characterised by specific electrocardiographic changes (absent P and high T segments with increased S-T deflection) and high serum potassium level Sudden death may result from heart failure if the condition is not promptly

or lingering doubts he may have regarding his fitness Failure to take such steps and the creation of a wholly unnecessary atmosphere of fussy or solicitous attention often leads in neurotically predisposed persons to the development of post traumatic neurosis

When loss of consciousness is prolonged the existence of cerebral contusion or other structural changes in the brain may be confidently assumed, and the degree gauged to some extent by estimation of the level to which consciousness has been restored when the patient is first seen He should be nursed in the lateral decubitus without pillows and with the foot of the bed raised in order to prevent inhalation *pneumonia A constant watch must be kept and hourly* observations made of the behaviour size of the pupils and pulse and respiratory rates The bladder is emptied by catheter the mouth swabbed out and fluids given regularly through an œsophageal tube

In certain cases of severe head injury where profound coma with hyperthermia and signs of embarrassment of vital centres present artificial hibernation may be employed Chlorpromazine (Largactil M & B) is given initially as 200 mg intravenously in saline over a period of three to four hours followed by intramuscular dosage with 50 mg and pethidine 50 mg as required The patient is covered with a wet sheet and packed around with ice bags so that the rectal temperature is kept at 27 30 C for several days This treatment produces marked lowering of intraventricular pressure with lessened tendency to intracranial bleeding The method is especially valuable in high intracranial pressure hence its use in cases of cerebral tumour before and during operation in subarachnoid bleeding and morphine and barbiturate poisoning Other indications for hypothermia are acute thyrotoxicosis severe heat effects and hypertensive crises

In favourable cases coma gives place to restless movements which gradually become more purposeful until the patient will answer simple questions At this stage noisy delirium may be troublesome It is best controlled by the intramuscular injection of 2 5 ml of paraldehyde this dose being repeated as required Morphine should not be given on account of its tendency to increase intracranial pressure If

paraldehyde f ils to sedate soluble phenobarbitone gr 3 intramuscularly may be tried

It is easy to recogni e recovery from unconsciousness but difficult in severe cases to as ess the gradations that may follow between moderat clouding and full consciousness In the later stages part cularly the patient may appear rational enough on superficial examination or may lamour to be allowed up or go home But until he is fully conscious in the sense that he has insight and memory is correctly orientated and capable of both registering and recalling new information he should be kept at rest under close observation Occasionally a post trauma ic psychosis develops disor ntation persisting for days or weeks and being accompanied by a facile mood of euphoria and con fabulation The prognosis however is none the worse for recovery

In all cases of severe head injury rehabilitation by gradu ated physical and mental exercises and occupational therapy must be undertaken circumspe tly Allowance must be made for em otional factors wh h may arise not only from fear of possible harmful consequences but from recognition by the patient of residual disabilitie *e g* dysphasia undue mental fatigue tinnitus deafne s facial scarring or d formities A nice balance must be maintained between making too hurried or too leisurely progress The extent to which headache mental fatigue and other symptoms are experi enced in response to retraining is a reliable guide Properly supervised occupational therapy is of special value both in stim lating the recovery of interest in work and in enabling those in charge of the patient to determine to what ext nt he has regained his original capabilities.

The treatment of post traumatic epilepsy is discussed in pag 313

For chronic subdural hæmatc ma see pag 301

Subdural hygroma or hydroma due to tearing of the meninges and collection of clear fluid in the subdural space over the vertex or lateral co vexity of the brain, may produce symptoms indistinguishabl from those of chronic subdural hæma oma. This lesion may be responsible for persistent headache giddiness and other post traumatic symptoms

which persist long after consciousness has been fully recovered The condition is recognised by lumbar encephalography radiographs being taken immediately and in twenty four to forty-eight hours after the introduction of air Treatment is operative

INTRACRANIAL VASCULAR LESIONS

Subarachnoid Hæmorrhage

Absolute rest and quiet are necessary The use of morphine is justified to relieve agonising headache and pain its emetic qualities often make it a mixed blessing but antihistamine drugs such as cyclizine given concurrently will help in this respect Soluble phenobarbitone gr 1½ 3 intramuscularly is preferable in many cases In an unconscious patient the routine nursing details must be attended to Lumbar puncture is an essential diagnostic measure but the value of repeated thecal drainage is doubtful Rest in bed should be maintained for six to eight weeks from onset of the bleeding The patient is allowed to adopt whichever po ture is most comfortable and as a rule sedatives such as phenobarbitone are required for several weeks Return to normal activities must be slow on account of the risk of further bleeding Hypertensive subjects should have treatment of that condition and straining at stool avoided by the use of laxatives

Congenital intracranial aneurysm may sometimes be diagnosed before rupture by the advent of migraine of increasing severity visual defects or oculomotor and trigeminal pareses Such patients should lead a sheltered life and avoid physical or emotional stress and the surgical possibilities must be considered

The mortality in the attack phase is up to 50 per cent under medical care and surgical treatment is rapidly becoming routine in young subjects In suitable cases further hæmorrhage is prevented Hypothermia and hypotensive drugs have made operative interference safer and the present tendency is to operate in about two weeks after cessation of bleeding although some favour immediate surgery Cerebral angiography should first be done to determine the presence

and site of the aneurysm and the existence of adequate collateral circulation from the carotid system of the opposite side. Ligation of the internal carotid is successful in young subjects where the aneurysm lies below the level of the anterior clinoid processes; other resources include direct attack on an aneurysm by ligation or clipping; the proximal vessels may be clipped; ligation of the common carotid artery. Arteriovenous angiomas if small may be excised or have the afferent arteries tied; large or inaccessible specimens are at present an unsolved problem.

Cerebral Hæmorrhage, Embolism and Thrombosis

Few elderly hypertensive or arteriosclerotic patients survive intracerebral hæmorrhage and little can be done for them. Venesection and the withdrawal of cerebrospinal fluid give no more than temporary improvement. Some cases of cerebral thrombosis and embolism (the latter most frequently encountered as a complication of mitral stenosis) have been treated by stellate ganglion block with procaine, the object being to improve the collateral circulation, but there is no proof of the efficacy of this method. Cortisone and d lta steroids had some vogue in cerebral thrombosis and embolism but there is no convincing evidence of their utility. A. Barham Carter (1957) found anticoagulant therapy valuable in cerebral embolism.

In the apoplectic stage the patient should be nursed in semi-recumbency, the head supported on a pillow and the position in bed frequently changed to avoid pressure sores and lessen the risk of hypostatic pneumonia. When there is vomiting it may be desirable to nurse the patient flat with the foot of the bed raised to prevent inhalation pneumonia. The use of antibiotics during the critical first week is to be recommended in hope of lessening chest complications, especially in the elderly. Diet may be neglected for a few days, but fluid should be given by mouth if the patient can swallow; if not, œsophageal intubation is indicated. The mouth should be swabbed free of mucus and saliva at intervals and distension of the bladder avoided by regular catheterisation. A small enema at the outset will clear the lower bowel and prevent soiling of the bed.

In the stage of recovery the paralysed limbs must be put through a full range of passive movement several times daily Soon the patient will be able to help in performing upper limb movements by interlocking the fingers of the unaffected hand with those of the paralysed limb Early splinting is undesirable The paralysed arm should be supported on a soft pillow placed beside the patient The paralysed lower limb should be kept fully extended at the hip and knee joints and foot drop prevented by a pillow and cradling of the bed clothes In favourable cases gradual recovery of voluntary power is seen in the leg within a week or two

Prolonged bed rest is unnecessary and often harmful As soon as the patient becomes mentally clear and co-operative and signs of recovery are apparent he should sit in a chair by the side of the bed for longer periods each day The next stage is to support him on either side and encourage standing part of the body weight being borne by the affected leg Walking exercises assisted in this way are then begun so that within a relatively short period the patient can manage with one attendant Meanwhile passive movements of the paralysed arm are given as often as possible the patient not only adopting the procedure described above but moving the paralysed fingers individually with the aid of his sound hand In this way the development of spasticity and contractures can be largely prevented and the patient s efforts will be rewarded by the recovery of some voluntary power at the shoulder and elbow joints Recovery of full voluntary power in the hands and fingers is unusual But if the general condition of the patient warrants efforts to promote further recovery should be continued long after he is able to walk unaided When the dominant cerebral hemisphere has been involved with resulting dysphasia the services of a speech therapist are invaluable but discretion must be shown in the selection of patients for clearly not all are likely to profit Systemic diseases such as hypertension diabetes and syphilis should receive circumspect treatment

Cerebral venous thrombosis. May follow mastoid or nasal sinus infection or post partum sepsis Usually there are repeated Jacksonian or generalised epileptiform fits followed

by hemiparesis Heparin is recommended with the object of arresting spread of the venous thrombosis but its use is not without risk in puerperal cases Prompt antibiotic treatment is indicated Paraldehyde 5 ml should be given intramuscularly at once if there is a succession of fits and this may be repeated if necessary but in most cases the fits cease shortly after their first appearance and with the development of hemiplegia. When there is initial unconsciousness and the period of recovery is slow and marked by noisy delirium, neurosurgical intervention may be advisable to exclude the possibility of an intracranial abscess arising from a septic embolus A septic embolic source should have appropriate treatment

Cerebral Hypoxia

A serious complication of cerebral ischæmia which presents in diverse conditions such as severe anæmia. comatose states (hypoglycæmia barbiturate intoxication and alcoholism) acute respiratory obstruction hepatic coma shock and cardiac standstill in the course of general anæsthesia and surgical operations Early recognition is important as damage due to cerebral œdema is reversible at first

Treatm nt consists of securing a free airway (aspiration of pharyngeal secretions and tracheotomy if necessary) oxygen inhalation and mechanically assisted respiration if required then treatment of the primary factor *e g* anæmia cardiac failure Shock and hypotension are indications for supporting the blood pressure by noradrenaline (p 239) To lessen cerebral œdema oral fluid is restricted and hypertonic infusions given by vein

Fifty per cent. sucrose 40 ml and repeat in fifteen and thirty minutes if response not adequate (D E. Argent *et al* 1956)

Human plasma in four fold concentration

Massive dosage of vitamin B (as 'Parentrovite')—about 300 mg. thiamine in twenty four hours—is of considerable value

DISORDERS OF THE EXTRA PYRAMIDAL SYSTEM

Parkinsonism

This syndrome may be the sequel of encephalitis lethargica in young subjects or a manifestation of cerebral arteriosclerosis in the ageing Parkinsonism in the middle ag d is usually due to neuronic degeneration of the basal ganglia Other occasional causes are trauma and cerebral hypoxia e g carbon monoxide poisoning

General management calls for much patience and sympathetic handling Although intellect is usually unimpaired the condition constitutes a grave barrier to all activities The sufferer should be encouraged to remain as active as possible to retain previous skills and social and cultural interests He should be protected from stress and given prompt treatment for intercurrent illnesses Physiotherapeutic measures are on the whole disappointing but muscle relaxation and postural correction are worth while The value of psychotherapy is doubtful but the young encephalitic with abnormal personality traits requires prolonged psychiatric supervision if of anti social proclivities institutional care is necessary

Drug treatment Symptomatic improvement is maintained only so long as therapy continues and as tolerance builds up increased dosage or drug combination must usually be employed Substitution of drugs of different groups will maintain therapeutic effectiveness but the process must be gradual and dosage adjusted to the smallest which controls symptoms

The *solanaceous alkaloids* (atropine hyoscine stramonium) have a good effect on muscular rigidity and salivation Tincture of stramonium has the least unpleasant side-effects and dosage is begun with 5 minims thrice daily before meals and increased gradually to 60-120 minims or more daily Post-encephalitic subjects display better tolerance than the older degenerative types

The *synthetic parasympatholytic group* are more effective and less liable to induce unpleasant side-effects than the alkaloids but they have little effect on tremor or sialorrhoea.

Benzhexol (Artane Lederle) caramiphen (Femadrin B W) ethopropazine (Parpanit Geigy) procyclidine (Diparcol M & B) and diethazine (Lysivane M & B) are representative Benzhexol is in general use the dosage being 1 mg thrice daily increasing gradually to 10 30 mg daily by divided dosage Members of these groups must be used with extreme caution in the elderly on account of the risk of precipitating glaucoma

The *antihistamines and related preparations* are useful in combination or alternation with the above groups In particular they induce a calm and cheerful state of mind if given towards night sound sleep follows Diphenhydramine (Benadryl P D) phenindamine (Thephorin Roche) and dimenhydrinate Dramamine Searle are commonly used in parkinsonism. Disipal Camden Chemical has found favour in many clinics for patients resistant or intolerant of the foregoing Dose 50 mg thrice daily gradually increased to 200-300 mg daily Benztropine Cogentin Merck, Sharp & Dohme (1 3 mg daily) has affinities with both para sympatholytic and antihistamin drugs and is reputed to be effective against tremor

Stramonium benzhexol phenindamine is probably the most generally effective popular and pleasant cycle Dextro-amphetamine is a useful adjuvant particularly to antihistamines In dosage of 1 3 5 mg tablets daily it will lighten the mood prevent drowsiness and lassitude and thus inspire activity It diminishes the severity of oculogyric crises in post-encephalitic subjects

Surgery Not of general applicability but may be helpful in severe unilateral tremor or rigidity in young subjects Interruption of the motor tract at various levels (cerebral cortex peduncle spinal cord) has inherent disadvantages Section of the efferent fibres of the globus pallidus reduction of its blood supply and alcohol injection have been done for relief of rigidity and tremor without impairment of sensory or motor function

Hepatolenticular Degeneration Wilson s Disease

Due to an inherited metabolic defect inability to synthesise the copper binding serum protein caeruloplasmin copper

transport is consequently difficult and the metal accumulates in the liver and brain. Osborn and Walshe (1958) demonstrated that penicillamine (β β-dimethyl-cysteine hydrochloride) 0 9 1 5 G daily orally has a greater cupruretic effect than BAL. Sodium calciumedetate has also been given to promote copper excretion and potassium sulphide orally diminishes alimentary absorption of copper Unaffected siblings may require prophylactic treatment.

Chorea (Sydenham s Rheumatic Chorea)

Absolute rest in bed in a quiet room or ward is necessary at the outset If the choreic movements are violent the top and sides of the cot should be padded to prevent bruising and abrasions A flannel dressing gown should be worn as the bed covers are often kicked off Food should be liquid or semisolid at first and in severe cases may be given from a feeding cup with a piece of rubber tubing attached to the spout Choreic children are often undernourished and the caloric intake should be high liberal protein in the form of milk eggs and protein supplements is given When muscular movements and inco-ordination make swallowing difficult feeding should be by tran nasal œsophageal tube of which children are surprisingly tolerant

Sedatives must be liberally employed at first and phenobarbitone (gr ½ per 14 lb body weight daily) is generally useful Sodium butobarbitone 0 1-0 2 G twice to thrice daily may be substituted temporarily in resistant cases Chloral hydrate in combination with reserpine or chlorpromazine has given good results in severe cases Aspirin is of definite value where a rheumatic element is conspicuous and is ordered in dosage of gr 30-60 daily with alkalis The adrenal corticosteroids have also been used in cases showing rheumatic features their effect on the chorea is doubtful

When the choreic movements are under reasonable control visits from friends interesting bed games and activities of an exciting nature may be gradually resumed Later hydrotherapy and muscle training games lessen awkwardness and hypotonia and have diversional value Tonics of iron and vitamins are helpful during convalescence Bed rest should be maintained for a minimum of four weeks in

uncomplicated cases and then the patient may be allowed to sit up in a chair provided that mental poise has been substantially regained He should be encouraged to rest out of doors when the weather is fine but augmentation of physical activity must be gradual

Choreic children are usually intelligent and sometimes precocious over pressure of school work and competitive examinations should be discouraged The domestic atmosphere should be free from extremes of over solicitude and harshness

After-care is that of other rheumatic diseases Septic foci such as tonsils should be dealt with on their merits and during a quiescent phase Routine tonsillectomy is of no value in preventing relapse Prophylactic chemotherapy appropriate to the rheumatic state may be indicated (see p 51)

The heredo-familial and degenerative types of chorea require treatment similar to that described for Parkinsonism Some of these patients ultimately develop psychoses and require institutional treatment

Chorea gravidarum if mild responds to rest and sedation as described above Termination of pregnancy will be necessary in severe cases uninfluenced by medical treatment and in those manifesting psychotic tendencies

The Epilepsies

Anti-convulsive treatment should not be ordered—except as a temporary measure—until the possibility of symptomatic epilepsy has been excluded When due to syphilis intracranial tumour cerebral vascular disease or injury treatment of the primary condition is required Epilepsy in childhood when related to hypoparathyroidism is effectively controlled by A T 10 (dihydrotachysterol) Fits due to hypoglycæmia may be relieved by excision of an islet cell tumour of the pancreas The occurrence of fits and disturbances of memory in diabetics—especially in elderly subjects—is an indication for reduction or withdrawal of insulin therapy In temporal lobe epilepsy when a constant discharging focus can be identified, fits may be abolished by excision of the diseased portion of the temporal cortex

The following recommendations apply to patients suffering from idiopathic epilepsy

General management In a fair proportion of cases regular *supervision and anti-convulsive treatment* over a period of years will either arrest the fits or reduce their frequency so effectively that the patient can go on with his occupation The more actively employed a patient is the less the tendency to fits Occupations involving climbing ladders or contact with machinery are obviously dangerous as are swimming cycling driving and sailing. In recent years *legislation* has made it possible in some districts for a proportion of epileptics to be employed in groups on *approved work in factories The importance of steady* employment and interest in the job cannot be exaggerated

The education of child epileptics must be encouraged Serious cases with mental defect or antisocial tendencies are best treated in special institutions

Over indulgence and excesses of all kinds are harmful and alcohol should be avoided also the drinking of large amounts *of fluid—a practice which may induce attacks The potential* danger of taking long journeys without food and of irregular meals should also be mentioned but apart from these reservations the patient should be encouraged to lead as natural a life as possible Dietetic restrictions are unnecessary although a ketogenic diet is occasionally useful to tide a child over a particularly severe convulsive sequence

Drugs Once begun *treatment should be continued* without intermission until the patient has been free of fits *for three years* The irregular use of anticonvulsant drugs is ineffectual and dangerous on account of the risk of status epilepticus If fits occur only infrequently careful considera tion should be given as to whether drugs are really necessary or expedient and if the patient is not prepared to take them steadily he is probably *better without*

All patients should be seen regularly *e g* fortnightly or *monthly at first* and then at increasing intervals depending on the fit frequency If for any reason it is desired to change a drug it should not be withdrawn suddenly but gradually replaced by the new one

Bromides are rarely used not because they are ineffectual

but because slightly better results are obtained with phenobarbitone and newer drugs which are taken as solids They are useless in psychomotor and petit mal epilepsy Their tendency to cause skin rashes and digestive disturbances can be corrected to some extent by the addition of alkalis or small doses of Fowler s solution The usual dose is gr 30-60 (2-4 G) daily for an adult Good effects are dependent on maintenance of the blood bromide level at about 200 mg per cent Tincture of belladonna or sodium borotartrate (gr 10-15 thrice daily) may be given in combination with bromides and smaller doses will then suffice If the fits show diurnal or nocturnal incidence the major proportion of the daily dose should be taken about an hour before the anticipated time of onset If the attacks synchronise with the menses the dose of bromide (or other antileptic agent) should be doubled during the few days before the period and halved in the intermenstrual phase salt and fluid restriction and diuretics may also help

Phenobarbitone is the most popular remedy for major epilepsy It may be used alone or in combination with bromides or phenytoin Phenobarbitone is given in dosage of gr 1-4 daily divided according to the main incidence of the attacks Combined therapy is often more successful than larger doses of a single drug For mainly diurnal fits gr 1 2 of phenobarbitone should be taken on rising and gr 15 of bromide on retiring The smallest dosage which controls the attacks is the correct one overdosage with barbiturates may increase attack frequency As a rule phenobarbitone gives rise to no unpleasant side-effects Somnolence may occur at the upper dose levels but this can be counteracted by the administration of caffeine citrate gr 5 or amphetamine 5 mg daily Urticarial and morbilliform rashes occasionally occur Methylphenobarbitone (Rominal Bayer) is much less sedative in action, and is used in double the phenobarbitone dosage

Primidone ('Mysoline I C.I) is claimed to be less toxic and more effective than the foregoing in controlling grand mal It is useful against psychomotor and focal attacks also

The initial dose is 0 25 G daily for three days this being increased to a total of 1 5 2 G daily in divided fractions,

Children show relatively good tolerance initial dose 0 125 G increased in the same way

Soluble phenytoin (Epanutin P.D Solantoin Glaxo) Effective in many cases of grand mal and it benefits a proportion of petit mal sufferers Its hypnotic action is slight, the main action being elevation of the convulsive threshold The dose is 0 2-0 6 G daily and the capsules should be given with two ounces of water after meals This drug may convert grand mal attacks to the petit mal pattern but it has a good effect in psychomotor attacks which are uninfluenced by barbiturates Phenytoin is very frequently used in conjunction with barbiturate therapy particularly in mixed epilepsy and the adult requirement is in the region of gr 4 of each

Toxic manifestations are commoner than with the above-mentioned drugs and consist of mental irritability and confusion skin rashes ataxia and gingival hyperplasia

In cases not adequately controlled by phenobarbitone phenytoin therapy methoin (Mesantoin Sandoz) may be given alone (0 1 G thrice daily and slowly increased) or added in (0 1 G daily and increased by 0 1 G weekly) Blood dyscrasia may complicate methoin treatment Megalocytic anæmia may complicate treatment with phenobarbitone primidone and phenytoin Folic acid has been found effective in correction of anæmia and reduction of fit incidence

Troxidone (Tridione Abbott) Exhibits a reverse action to other anti-epileptic drugs in that it is more effective against petit mal and its myoclonic and akinetic variants than grand mal Its efficiency in controlling petit mal however is by no means constant and toxic effects are common in the shape of dermatitis nephrosis hepatitis aplastic anæmia and thrombocytopenic purpura Careful supervision is required therefore of all patients taking the drug and it should not be prescribed in the presence of renal or hepatic defect It is supplied in 0 15 G capsules and the daily adult dose is 3 7 capsules infant 1 capsule two to four years 2 capsules five years 3 capsules

In cases of mixed grand and petit mal troxidone must be given in combination with phenobarbitone or phenytoin to control the convulsive element

Phensuximid (Milontin P D) Possesses marked anti convulsant properties with little toxicity should be tried in cases resistant to troxidone Dose 1 2 capsules of 0 5 G twice or thrice daily (infants 0 5 G daily) Withdrawal must be gradual The most effective remedy for petit mal and pyknolepsy Not advised in pure grand mal

Aceta olamide (Diamox Lederle) A carbonic anhydrase inhibitor diuretic which acts by reducing *p*H of the blood thus raising the convulsive threshold It is worth trial in premenstrual epilepsy

Treatment of the attack If heralded by subjective pheno mena *e g* tingling in an extremity prompt application of a tourniquet may check the fit In cases with prolonged aura, a powerful muscular effort or an inhalation of amyl nitrite may act similarly During the seizure the patient should be laid recumbent with the head turned to one side and tight clothing and neckwear loosened A rubber wedge or a padded key should be inserted between the jaws to prevent injury to the tongue Frothy mucus blood or vomitus must be wiped from the mouth Gentle restraint may be used to prevent the patient from injuring himself against hard objects He should be allowed to remain quiet for some time after the convul ions have subsided

Status epilepticus. A serious condition characterised by a succession of convulsive seizures without conscious intervals Soluble phenobarbitone gr 3 intramuscularly is a useful drug and the dose may be repeated in three hours Thio-pentone sodium (Pentothal Abbott) is used intravenously also Bromethol (Avertin Bayer) in dosage of 0·1 ml of 2 5 per cent solution per kg body weight rectally after a cleansing enema is used in obstinate cases Paraldehyde is the safest and most satisfactory routine 8 10 ml is injected into the gluteal muscle with ma sage of the injection site Subsequently 5 ml is injected every half hour until the fits cease The paraldehyde can if necessary be added to an intravenous drip

Migraine

Hered ty and constitution play an important part, the headaches tending to recur at irregular intervals and with

soothing Food is regarded with extreme distaste but glucose drinks and strong coffee should be given. One or other of the following analgesics may be prescribed soluble aspirin or codeine compound tablet gr 10-20 Tabloid Empirin Compound with Codeine B W one to two tablets and repeat in two hours if necessary Nembudeine Tablets, Abbott similar dosage

Ergotamine tartrate is most effective in relieving migraine *by reducing the amplitude of arterial pulsations and restoring* vascular tone 0 25 mg is given subcutaneously and if only *partially successful may be repeated in six to twelve hours* In subsequent attacks an initial dose of 0 5 mg may be used *if necessary but the maximum is 1 mg in twenty four hours* Oral combinations based on ergotamine are popular for episodic therapy (Migril B W Orgraine Organon) Dose up to 6 tablets over 4 hours Prochlorperazine (Stemetil M & B) is effective for relief of nausea and vomiting Prevention 20 mg daily cure 20 mg followed if necessary by 10 mg. in one hour

Headache

Every effort must be made to find the cause of the headache before relegating the sufferer to symptomatic treatment The best routine drug is aspirin *alone or in combination with* codeine caffeine or phenobarbitone Refractive errors nasal sinus disease and histamine sensitivity are *occasionally* responsible headaches may be due to industrial toxic factors or unhygienic working conditions while a large proportion are of psychogenic origin Their importance lies in the prolonged disability to which they may give rise and the useless expenditure of drugs which may be occasioned by failure to recognise this cause Psychotherapy may be curative after a few interviews Cases showing fibrositis of the posterior cervical muscles respond to infiltration of the *trigger spots* with procaine and stretching the affected muscles Dietetic indiscretions dyspepsia biliousness and *constipation are often blamed for headache* occasionally the removal of impacted fæces from the rectum gives dramatic *relief In dyspeptics addicted to the use of alkalis* however headache and vomiting may be signs of alkalosis and prompt

relief follows stopping these drugs Chronic microcytic anæmia in women is often overlooked as a cause and iron therapy is curative The treatment of headache and vomiting in arterial hypertension is described in page 238

Anorexia Nervosa

This is a psychogenic disorder and found mostly in young women Complete failure of appetite quickly follows refusal of food and a serious state of emaciation and inanition supervenes Absence of wasting of the breasts and external genitals and retention of axillary and downy hair are characteristic Treatment is by psychotherapy planned in accordance with the patient s environment and difficulties Progress is likely to be hindered by the ministrations of harassed and solicitous relatives and removal of the patient to hospital is desirable A capable nurse of strong personality can usually persuade the sufferer to eat Insulin therapy and prefrontal leucotomy have been used

Tics and Habit Spasms

An unstable or over sensitive nervous system is often associated with such conditions but many ticquers being otherwise well adjusted are successful in life and paying no attention to their tics suffer little or no embarras ment from them.

In children all sources of peripheral irritation should be attended to *e g* uncomfortable clothing (shrugging tics) visual defects (blinking tics) nasal catarrh (sniffing tics) The general health should be improved by adequate outdoor exercise and nourishing diet Care must be taken however not to overdo such treatment as harm may be done in focusing undue attention on the complaint Domestic or school anxiety injudiciously handled by parents or teachers is a common cause of tic in school hildren and psychotherapy is often needed The aim is to restore the child s confidence and persuad the parents to ignore the tic When this cannot be done at home there is much to be said in favour of bringing the child into hospital for a short period of supervision and mild sedation.

Spasmodic torticollis. This rare complaint of adults may follow mental shock or occasionally *encephalitis lethargica* In most cases the ætiology is obscure and treatment dis appointing When the condition is hysterical dramatic results may follow treatment by suggestion or hypnosis but in true spasmodic torticollis it cannot be said that psychotherapy has any curative effect although it may help the patient to adjust himself to the disability

In recent cases with severe involuntary movements rest in bed for three or four weeks is indicated and phenobar bitone or bromide in small doses should be given If there is improvement the patient may then be encouraged to carry out remedial exercises in front of a mirror Possible con tributory causes—errors of refraction and osteoarthritic changes in the cervical spine—should be sought and treated Splinting by means of a plastic or metal collar may be tried when the movements are not severe and can be checked by the patient supporting the chin with his hand But usually such mechanical devices fail to achieve their purpose The same applies to operative treatment (division of nerves or muscle fibre) which has had extensive trial in the past Temporary relief may follow but the movements tend to recur or spread to neighbouring groups of muscles

THE CRANIAL NERVES

Optic Nerve

Papillœdema due to increased intracranial pressure is an indication for operative relief to avoid blindness In all cases of apparent primary optic atrophy the possibility of a local lesion—chromophobe adenoma or suprasellar cyst, meningioma congenital aneurysm arachnoiditis—should receive consideration before the condition is assumed to be irremediable Sudden blindness preceded by distressing facial pain may occur in the elderly as a consequence of temporal arteritis If the optic atrophy is due to syphilis or poisoning by metals benzene ring derivatives alcohol or tobacco therapy appropriate to these conditions must be instituted Retrobulbar neuritis may be due to disseminated

sclerosis gross dietary and vitamin deficiency syphilis or disease of adjoining structures and treatment of the primary condition is indicated Thiamine and cortisone have given good results in some cases

Oculomotor Nerves

Lesions may be caused by injury or disease of the brain stem or by raised intracranial pressure and treatment must be directed to the main condition Diplopia and ptosis are sometimes the first signs of myasthenia gravis (p 300) Unilateral sixth nerve palsy may occur as a sequel of spinal anaesthesia The wearing of an eye shade or of spectacles having a frosted glass covering the affected eye obviates diplopia and vertigo Ptosis may be relieved by plastic procedures Ocular deviation is sometimes improved by operation provided that the lesion has become stationary Prisms are of little help

Trigeminal Neuralgia

Infective conditions of the teeth and nasal sinuses call for treatment Symptomatic relief may be given by aspirin phenacetin and codeine Quinine may be combined with aspirin and cod ine in powder form Local treatment with rubefacients and short wave diathermy gives temporary relief in some cases

Post herpetic neuralgia can be so persistent and intractable in elderly subjects as to lead to depression and suicidal intent Deep x ray treatment to the region of the Gasserian ganglion on the affected side is sometimes effective but alcohol injection or section of the sensory root is of little avail. It may be justifiable in certain cases to recommend the operation of leucotomy

Tic douloureux is distinguished by its paroxysmal quality localisation of the pain to one or more divisions of the nerve presence of trigger points absence of any sensory impairment and freedom from pain between attacks Usually the cause is not obvious, medicinal treatment fails, and pethidine or the inhalation of trilene is required to bring relief Treatment by alcohol injection is effective the injection being given into one or other branch of the ganglion.

Injection of the ganglion is to be preferred in elderly debilitated subjects who are unsuitable for the more formidable procedure of retroganglionic root section. The sensory loss which follows successful treatment may cause troublesome keratitis if an eye shield is not used The conjunctival sac should be irrigated for some weeks after operation

Temporo-mandibular neuralgia (Costen s syndrome) This is responsible for a number of cases of atypical facial neuralgia The pain is noticed especially on chewing and is referred to the ear and the side of the tongue There is often a *history of forcible opening of the jaws through inserting* a gag at operation or of dental clearance the dentures fitting badly and allowing overclosure to occur on biting Temporary relief from pain can be had by the injection of procaine into the petrotympanic fissure but good results are obtained in edentulous subjects by providing a specially built up lower denture to prevent overclosure of the bite

Glossopharyngeal neuralgia This may arise independently or as a complication of tonsillar or pharyngeal neoplasm or inflammation The medical treatment of idiopathic cases is as for trigeminal neuralgia If ineffective section of the nerve *in its intracranial course may be done*

Facial Nerve

The nerve may be involved in lesions in the cerebellopontine angle (rarely acoustic neuroma) in the temporal bone (otitis media) or in its external course (trauma) Facial palsy may be an early sign of polyneuritis and it occurs as an isolated symptom occasionally in disseminated sclerosis In these conditions treatment of the primary cause is indicated

The most common variety—**Bell s palsy**—is attributed to *compression or neuritis in the aqueduct or trauma in its* external course Spontaneous recovery is to be expected in the majority of cases within weeks or months Protection of the affected side of the face is necessary and for the first week the patient should stay indoors preferably resting Thereafter exposure to wind and dust should be avoided and an eye shade worn Undue stretching of the paralysed muscles should be prevented by wearing a light splint *e g*

a piece of bent copper wire covered by cycle valve tubing the appliance being moulded to the side of the face with one end hooked into the corner of the mouth to retract it and the other held in position behind the auricle Active movements before a mirror are helpful

It is advisable two or three weeks after the onset to test the electrical reactions of the paralysed muscles A normal response indicates the probability of repair and complete recovery Absence of any response to faradism is a sign that recovery may be slow or incomplete In these circumstances there is justification for the employment of massage and gentle galvanic stimulation If there is no sign of recovery however it is unwise to persist with the latter as unsightly contractures may result Diathermy may be tried empirically but vitamins and drugs internally are useless occasional successes have followed cortisone therapy Decompression operations have been successful in selected chronic cases (T Cawthorne 1956) Fascial slips and nerve grafting have been employed to diminish the facial disfigurement in irrecover able cases

Facial hemispasm Reassurance that the condition is not likely to progress may be given in most cases Nervous subjects benefit from small doses of phenobarbitone In jection of the facial nerve with alcohol is rarely justifiable and it will be undertaken only after its effects in causing paralysis have been fully explained

Auditory Nerve

Tinnitus may be the result of wax in the auditory meatus middle ear inflammation or otosclerosis It occurs in Ménière s syndrome in acoustic neuroma arterial hyper tension after fractures involving the temporal bone and in temporo-mandibular neuralgia Treatment is of the under lying cause When the cause is not apparent and the tinnitus is accompanied by signs of anxiety or depression a difficult decision arises—whether to recommend such a radical pro cedure as labyrinthectomy or intracranial division of the nerve or to treat the case as a psychiatric problem. Sedatives such as phenobarbitone gr ½ twice daily (with or without reserpine or chlorpromazine) may be tried, but if the affective

disturbance grows along with obsessional preoccupation with the *symptom and no physical cause can be found* electrical convulsion therapy may be indicated

Ménière s syndrome The patient should lie quiet until the attack subsides An inhalation of amyl nitrite will help in hypertensive cases For severe attacks a subcutaneous injection of morphine or an intravenous dose of soluble thiopentone may be necessary

Phenobarbitone is the best prophylactic remedy Dehydration therapy (low sodium diet ammonium chloride and fluid restriction) is occasionally of service (6-9 G ammonium chloride daily in 0 5 G enteric-coated tablets)

Histamine desensitisation has been used for relief of this troublesome syndrome The improvement may be due in part to vasodilatation For non reactors to histamine nicotinic acid may be tried in dosage sufficient to cause flushing of the face (50-100 mg thrice daily by mouth for four to five weeks) followed by smaller maintenance dosage This is useful for postural vertigo occurring independently of the labyrinthine seizures Antihistamines such as dimenhydrinate Dramamine Searle (50 mg thrice daily) cyclizine Marzine B W (in similar dosage) suit some patients for interval treatment while others benefit from chlorpromazine Largactil M & B 25 mg twice daily or its analogue prochlorperazine Stemetil M & B 5 10 mg twice daily

If all medical measures fail as is the case in 10 per cent of patients treated section of the eighth nerve (or destructive labyrinthotomy) should be considered Severe but temporary vertigo follows but a considerable degree of compensation ultimately occurs in the orienting mechanism Cervico dorsal sympathectomy is good in unilateral affections it relieves vertigo and preserves hearing

Motion sickness Hyoscine hydrobromide is a good remedy and gr $\frac{1}{100}$ should be given orally one hour before embarkation and repeated in two hours Further doses at six hourly intervals for twenty four hours if necessary

Antihistamine drugs have a prophylactic and curative action in motion sickness Gay and Carliner report good results from oral or rectal dosage with dimenhydrinate

Dramamine Searle a substituted derivative of diphen hydramine Prophylactic dose is 50 mg four hourly and before retiring for the first forty-eight hours of the voyage Curative dosage is about double this amount If necessary the tablets may be suspended in saline and given rectally

Cyclizine (Marzine B W) causes less drowsiness One 50 mg. tablet should be taken thirty minutes before embarka tion and repeated four hourly for forty-eight hours if necessary

Hiccough Hiccough is a troublesome symptom which may have such diverse causes as epidemic encephalitis tabetic crises pericardial effusion and uremia In simple irritative cases holding the breath for as long as possibl may cure The same result may be obtained by making the patient breathe into a paper bag Irritation of the nasal mucosa until sneezing is provoked a mouthful of iced water or a dose of undiluted spirits or Worcester sauce is effective on occasion

If the hiccough is symptomatic of a serious malady appropriate treatment should be initiated this includes such fundamentals as relief of abdominal distention or diaphrag matic irritation and correction of metabolic abnormalities Sedatives such as phenobarbitone chloral or hyoscine may be necessary Neurotic and toxic types benefit from the intravenous administration of glucose saline solution with 25 50 mg chlorpromazine (Largactil M & B) Further dosage with chlorpromazine (25 mg by mouth or vein) may be given as required

deformities In quiescent joints expert movement will often restore useful function and remedial exercises are planned with the object of retaining the improved function Arthrodesis of the knee elbow arthroplasty amputation of toes and excision of the ulnar head with radio-carpal arthrodesis have definite scope in correcting deformity or improving function when the active inflammatory phase has passed

Ankylosing Spondylitis

The general treatment outlined for rheumatoid arthritis is valid Gold therapy is often useless Cortisone is helpful in management of acute exacerbations and phenylbutazone is an effective analgesic Chloroquine is of some value Soft tissue relaxation is promoted by prolonged rest in the supine position The bed should be firm and fracture boards inserted to prevent sagging Pillows should be dispensed with as the spine straightens and this process is hastened if a long narrow pillow is placed longitudinally under the spinal column The application of a Savre s traction sling to the patient s neck will extend the cervical spine and assist in recovering its mobility Guthrie Smith s method of spinal slinging is useful for correcting kyphotic deformity Serial plaster casts or a hinged cast may be applied for correction of spinal flexion and later a spinal brace of the Goldthwaite type will help to maintain orthopædic improvement Massage to the back muscles will improve tone and relieve spasm.

Re-educational exercises should be prescribed to correct postural deficiencies to strengthen the shoulder girdle muscles and to overcome costo-vertebral fixation which increases the incidence of upper respiratory infections Deep x ray therapy is indicated in all cases it has been shown that the incidence of leukæmia in patients so treated is about 2 5 per cent *i e* the risk of acquiring the disease is increased ten fold This however does not weigh heavily against the method

A corrective osteotomy may be desirable for severe fixed flexion deformity

Osteoarthritis

The general health should receive attention and occu pational trauma of the affected joints avoided Obese

patients do better when suitable reduction measures are put in train Metabolic or endocrine abnormalities *e g* diabetes hypothyroidism menopausal upset must be treated Elimination of focal sepsis is desirable on general principles although the course of the disease is rarely influenced thereby Since osteoarthritis is degenerative rather than inflammatory in nature cortisone and deltasteroids are unlikely to have a striking suppressive rôle but in early cases these hormones relieve pain and enhance the efficacy of other measures Intra articular injections of hydrocortisone are of some value in early cases Aspirin phenacetin and codeine are necessary for relief of pain Gold treatment is of no avail in osteoarthritis

A judicious admixture of rest exercise and physiotherapy will help to conserve useful and painless function During exacerbations of the disease affected joints should be placed at rest by splinting or traction. Heat in the form of electric pads or short wave diathermy is soothing and a full range of passive movements should be executed daily More active physiotherapy may be instituted as soon as the patient is free from pain and the objectives are to delay loss of joint function and correct postural deformities Improvement in tone of the relative muscle groups is the most important rôle of physiotherapy Diathermy infra red and wax bath treatments relax spasm and make other manipulations more effective Massage to the muscles and passive and active movements are then given followed by postural exercises These remedial movements can with great advantage be done in a pool bath

Deep x ray therapy is useful where pain is a feature or where the joint lesions are rapidly progressive

Orthopædic treatment is helpful at all stages of the malady Provision of support fixation or prevention of weight bearing by means of suitable apparatus will keep the patient active and comfortable

Operative measures should be considered for extensive involvement of major joints. Removal of the patella and removal of bony spurs and synovia are sometimes helpful in knee joint affection Arthroplasty of the hip joint has not proved uniformly successful but the Schanz type of

subtrochanteric osteotomy with excision of osteophytes restores useful hip flexion Obturator nerve section is occasionally done to relieve hip joint pain in elderly and feeble subjects

Osteoarthritic Spondylitis

Treatment in general as for the rheumatoid type Defective posture should be corrected by traction-extension or plaster collar or jacket Physiotherapy is useful for improving posture and muscular tone Radiotherapy is beneficial in early cases Operative treatment is occasionally *symptoms or for fusion in cases showing disorganisation of* required in localised spondylitis either for relief of pressure intervertebral articulations

Fibrositis

The commonest form of non articular rheumatism usually affecting the cervical shoulder girdle and lumbar muscles Various localisations attract specific nomenclature *e g lumbago myofascial sciatica multifidus triangle syndrome* intercostal myalgia

The influence of cold damp and muscular overstrain is considerable and these should be avoided Ill fitting and draughty driving seats of motor vehicles and the closing of unwieldy garage doors are common precipitating factors Some cases show a background of neurosis Care must be taken to exclude serious conditions like ankylosing spondyl*itis intervertebral disc lesion myelomatosis or other* neoplastic involvement of spine or pelvis

In the simplest forms rest to the affected region and the application of heat by kaolin poultices hot stupes or baths electric pad or short wave diathermy will produce *prompt* relief

More extensive cases require rest in bed and continuous warmth The presence of systemic disease should be *excluded and in the case of lumbar or gluteal fibrositis* abnormality of the spine pelvis and pelvic viscera should be sought for Focal sepsis in teeth tonsils gall bladder or prostate may perpetuate fibrositic manifestations and *appropriate treatment* is desirable Salicylates and iodine may

be given also analgesic preparations as required Physiotherapeutic measures include deep massage to the affected muscles and movements designed to stretch them The use of hot pool baths increases the patient s tolerance of these measures Injection of local anæsthetic solution into tender points or trigger spots pressure on which elicits radiating or referred pain is a valuable method of treatment as it provides a pain free interval in which manipulation and full movement of the affected muscles may be performed thus relieving adhesions H A Burt (1957) recommends 5 10 ml of 0·5 per cent Lignocaine Hydrochloride B P C with 25 50 mg hydrocortisone and an ampoule of hyaluronidase (Hyalase Benger)

CHAPTER XVII

TROPICAL DISEASES

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Malaria

Malarial infection can be variously acquired 1 Commonly by the bite of an infective female anopheline mosquito in an endemic area 2 By transfusion of infected blood 3 By inoculation either accidental or intentional as a therapeutic measure in paralytic dementia 4 Malaria may occur in the newborn probably by transference of parasites from the maternal blood through placental injury during birth

Malarial infection may be overt or give rise to ill-defined relapses with chronic malaise and anaemia It should be noted that at the inauguration of a primary attack the fever *remains continuous for some days and the characteristic* recurrent pyrexia does not appear until schizogony has developed its proper rhythm This point may help to distinguish a fresh infection from a relapse

Treatment The choice of drug depends on (1) The degree of acquired immunity (2) The species of the parasite (3) The object to be attained *e g* whether treatment of an acute attack or eradication of the exo-erythrocytic pha e

Treatment of a clinical attack (*a*) *Non immune subject* In *P falciparum* infections there must be no delay in starting antimalarial treatment (danger of cerebral malaria) One of the 4 aminoquinolines chloroquine (Aralen Bayer Niva quine M & B) or amodiaquine (Camoquin P D) should be used Each tablet contains 0·15 G chloroquine base The

dose is 4 tablets initially followed by 2 tablets in six hours then 2 tablets daily for two days Each tablet of amodiaquine contains 0 2 G of base and the dose is 3 tablets initially and 2 daily for two more days Mepacrine hydrochloride 0 9 G on the first day 0 6 G on the second day and then 0 3 G daily for five days may also be used. Quinine is now seldom ordered as it may induce intravascular hæmolysis (black water fever)

In severe cases oral treatment may be too slow and *parenteral therapy is required (i) chloroquine hydrochloride* 0 2 G intravenously and repeated in six hours if necessary Or (ii) mepacrine methane sulphonate 0 375 G intramuscularly repeated in six hours Or (iii) quinine dihydrochloride 0 65 G (gr 10) in sterile normal saline injected slowly (not more than gr 1 per minute) Three such injections may be given in a twenty four hour period

(*b*) *Subjects partially immune* A single oral dose of one of the above drugs is usually sufficient Thus either chloroquine 0 6 G (4 tablets) amodiaquine 0 6 G (3 tablets) or mepacrine hydrochloride 0 3-0 5 G should be given in one dose

Cure of relapsing malaria Relapses in *P vivax* and *P malariæ* infections are due to persistence of the exo-erythrocytic phase This may be eradicated by the administration of one of the 8 aminoquinoline compounds Of this group primaquine and pamaquin are the drugs of choice The dose of primaquine is 15 mg. daily for fourteen days Careful supervision is necessary because of the occasional unpredictable occurrence of acute intravascular hæmolysis. Treatment with these drugs should be combined with an ordinary therapeutic course of chloroquine or amodiaquine but not mepacrine Proguanil ('Paludrine') and pyrimethamine may also be useful in eradicating malignant tertian infections but their action is slow They are best reserved for prophylaxis.

Prophylaxis and suppression. In order to obtain the full effect of any drug, regular dosage is essential. Chloroquine 0·3 G (base) or amodiaquine 0·4 G (base) weekly are effective suppressants Mepacrine taken over long periods may produce a lichenoid dermatitis, and does not appear to be any more efficient than chloroquine or amodiaquine

Proguanil monohydrochloride 100 mg daily or pyrimethamine 25 mg weekly have the advantage of acting on the pre-erythrocytic as well as the asexual erythrocytic forms of the parasite Drug resistance may appear in areas where either of these compounds is in common use

Management of common malarial conditions 1 *An ordinary attack of ague* Confine to bed and give copious fluids *e g* lemonade broths Keep the patient warm during the chill stage and change the bed coverings frequently in the sweating stage Iced water compresses are useful for relief of headache A standard drug treatment should be instituted at once The patient may be allowed up after a few days freedom from fever but he should avoid chill and fatigue during convalescence Iron should be given for two weeks or longer if the hæmoglobin is low

2 *Bilious remittent fever* This condition should be clearly differentiated from blackwater fever by examination of the urine Give fluid diet with extra glucose for vomiting sips of iced water and heat to the epigastrium Institute a standard drug treatment If vomiting interferes with oral administration of antimalarial drugs the intravenous route must be substituted Convalescence should be prolonged and anæmia corrected by iron

3 *Cerebral malaria* A disease of protean manifestations and in tropical practice its presence should be suspected in any patient showing pyrexia heat effects unusual neurological signs or mental symptoms It frequently arises in new arrivals to the tropics (incidental malaria)

Intravenous chloroquine should be given on suspicion and the patient treated as for heat hyperpyrexia (See p 73) *When consciousness returns a standard course of oral treatment* is begun At least one month s rest in a healthy climate is necessary before returning to work.

4 *Blackwater f ver* Some areas of malarious countries are notorious for the incidence of this extremely serious condition Such are usually hyperendemic with spleen rates of over 50 per cent Blackwater fever is a recurrent disease and the prognosis worsens with each relapse The onset is heralded by nausea and vomiting *with rapid development of intense* jaundice and passage of port coloured urine

The following routine must be established immediately

1 Stop all anti malarial drugs

2 Do not attempt to transport the patient a long distance to hospital Absolute rest in bed is essential

3 Maintain fluid and electrolyte balance If anuria develops institute treatment described on page 194

4 A blood transfusion should be given if available and repeated daily if anæmia is severe The blood must be carefully matched

5 ACTH and cortisone have been shown to exert a beneficial effect on the hæmolysis

6 Antimalarial treatment avoiding quinine can be safely given during the convalescent period

African Trypanosomiasis

The disease is due to infection with trypanosomidæ transmitted by bites of tsetse flies 1 *Trypanosoma gambiense* vectors *Glossina palpalis* and *Glossina tachinoides* 2 *Trypanosoma rhodesiense* vectors *Glossina morsitans* and *Glossina swynnertoni* Trypanosomiasis is common in animals thus creating a reservoir of infection

The incubation period is from seven days to three weeks Occasionally an infected person may show no symptoms for many years The second stage is characterised by pyrexia erythemata splenomegaly and superficial lymph gland enlargement most prominent in the posterior cervical triangle The terminal stage is marked by mental deterioration with delusions mania and characteristic lethargy The disease is most amenable to treatment during the first and second stages.

Treatment 1 *Tryparsamide* Effective at all stages, and specially indicated in the cerebral stage The initial dose is 1 G intravenously or intramuscularly and this may be gradually increased to 3 G in subsequent injections at seven day intervals The amount necessary for maximum therapeutic effect is 24 G Trypanosomes readily become resistant Toxic effects are (a) Primary optic atrophy Treatment consists of cessation of arsenical therapy and intravenous

administration of sodium thiosulphate (Ametox M & B 10 per cent solution) 0 5 1 G twice daily (b) Exfoliative dermatitis BAL is a useful remedy for this complication

2. *Mel B* (*Arsobal*) a combination of melarsen with dimercaprol a potent trypanocide especially useful in tryparsamide resistant subjects Many early cases have been cured by a single dose but a course of three daily injections of 0 2 G intravenously is commonly used Purpura and albuminuria may be caused by this drug and it should therefore be used only in hospital May & Baker produce a standardised product of Mel B in 5 ml ampoules containing a 3 6 per cent solution in propylene glycol A preliminary test dose of 0 5 ml of this solution should be given before embarking on one or several courses of treatment

3 *Suramin* (*Bayer* 205 *Antrypol*) Given in dosage of 1 G in 10 ml of water intravenously In early cases 5 G given over one week will produce maximal therapeutic effect but the course should be continued until 10 G has been given This drug has certain disadvantages (*a*) It may cause renal damage urticarial or herpetiform eruptions (*b*) It is useless in the cerebral stage of the disease

4 *Pentamidine* (M & B 800 *diamidino diphenoxy pentane*) Given in daily intravenous doses of 100 mg in 10 ml of distilled water for twelve days Toxic effects are nausea vomiting pruritis and fall in blood pressure

Courses of drug treatment 1 Early cases First and second stages of the disease Suramin 1 G intravenously weekly for ten weeks or one dose of 1 G intravenously followed by tryparsamide 1 2 G *at intervals of five days for nine to twelve doses or pentamidine 100 mg intravenously daily for twelve doses*

2. Late cases with cerebral involvement suramin 5 G intravenously over one week One week s rest interval Then tryparsamide 1 G increasing to 3 G twice weekly to a total of 24 G Mel B should be used in tryparsamide resistant cases

Prevention 1 Isolation and adequate treatment of all infected persons 2 The destruction of tsetse flies and their *breeding places in settlements* and individual precautions against bites 3 Prophylactic treatment of exposed persons with 1 G of suramin at intervals of three months

Leishmaniasis

This term includes two conditions due to infection by flagellate protozoa of the genus Leishmania kala-azar caused by *Leishmania donovani* and oriental sore due to *Leishmania tropica* The organism is readily obtainable in stained films of blood sternal marrow and spleen juice It is transmitted by the bite of the sandfly Phlebotomus

Kala-azar Visceral Leishmaniasis

World wide distribution e g India China and the Mediterranean littoral There is a characteristic continuous pyrexia with a double rise each twenty four hours Epistaxis and pigmentation of the face are early signs leucopenia with progressive enlargement of the liver and spleen follow

Treatment *Sodium stibogluconate* Pentostam B W A stable solution containing the equivalent of 100 mg pentaval nt antimony per ml for intravenous or intramuscular administration. Begin with small doses (1 2 ml) and gradually increase the dose on alternate days to 6 ml 60 ml constitutes a course and the drug is well tolerated

Neostam B W prepared as a 4 per cent solution in distilled water 0 1 G per 100 lb body weight is given slowly intravenously on alternate days to a total of 3 G per 100 lb body weight

Urea stibamine A useful preparation and free from side effects if given intravenously initial dose 0 1 G second dose 0 2 G subsequent doses 0 25 G Fifteen daily injections should be given this course may be repeated after one month if necessary

Tartar emetic A freshly prepared 2 per cent solution in distilled water is injected intravenously commencing with 2 ml Subsequent alternate daily doses are increased by 1 ml to a maximum of 5 ml A course consists of 4 G

Lithium antimony thiomalate (Anthiomaline M & B) Prepared as a 6 per cent solution 1 ml containing the equivalent of 0 01 C antimony This drug gives good results by the intramuscular route and is particularly useful for children Commence with 0·5 ml and increase by this amount on alternate days until 2 5 ml is being given Continue with this dosage for a total of twenty injections.

The pentavalent compounds mentioned above have displaced the trivalents e g Tartar emetic Anthiomaline from favour

Stilbamidine Useful for cases resistant to other drugs The solution should be freshly prepared and administered slowly into a vein The dose is 1 mg per kg body weight and the amount necessary for cure is about 400 mg. Subjective disturbances over the trigeminal area frequently arise during treatment More recently hydroxystilbamide has been used 3 3 mg per kg. intramuscularly each day for ten to twenty days

General management of a case of kala azar Attend to any concurrent condition such as malaria ankylostomiasis or anæmia Blood transfusions may be necessary Splenectomy may be indicated if there is an associated chronic hæmolytic anæmia *A full diet should be given Institute one of the drug treatments mentioned above Choose sodium stibogluconate if available Record the size of the spleen and liver and the leucocyte count during treatment*

Prevention of kala-azar Full treatment of all cases

Elimination of dogs if they are known to be a reservoir of infection *Sandflies should be kept down by the use of* dicophane (DDT)

Oriental Sores Cutaneous Leishmaniasis The infection is universal among natives of endemic areas and in such kala azar is rarely encountered Oriental sore is commonest on the exposed skin and it first appears as a papule then a macule which ulcerates and spreads leaving on healing a thin scar and an immune individual

Local treatment Carbon dioxide snow is useful for small lesions applied for thirty seconds every ten days Emetine 20 minims of 2 per cent solution or berberine sulphate 3 ml of 1 per cent solution or mepacrine 5 ml of 10 per cent solution may be infiltrated round the margin of the sore Deep scarring may result from x ray treatment and excision or application of caustic gives equally good *results* Penicillin is valuable in the presence of gross secondary infection

General treatment As for kala azar but the trivalent antimony compound stibophen (Fouadin Bayer) gives best

results The initial dose is 1 ml gradually increasing to 3 ml by twice weekly intr muscular injections over eight weeks

In view of the fact that the sores show a natural tendency toward healing treatment should be cautious Systemic treatment is as a rule necessary only in extensive and progressive cases especially with facial lesions for which local therapy cannot be given

Framboesia Yaws

This is a form of primitive syphilis caused by *Treponema pertenue* which is common in indigenous tropical communities and conveyed by non venereal contact The integuments are affected but not the viscera or central nervous system Treponemata can be obtained from scrapings of the primary and secondary lesions and the Wassermann and Kahn tests become positive The disease yields readily to organic arsenicals but not to mercury Yaws is compatible with good health mechanical deformity may result from such lesions as synovitis of the knee or mouth stricture

Treatment Antibiotics T pertenue is sensitive to these agents Two injections with seven days interval of procaine benzylpenicillin in oil with 2 per cent aluminium monostearate is effective (1 200 000 units for adults and 600 000 units for children) The tetracyclines in dosage of 2 G daily for five days may be given in cases where oral treatment is desired

Arsenic Neoarsphenamine intravenously was formerly used (0 6-0 9 G) Intramuscular sulpharsphenamine is preferable for children (und r ten years 0-3 G and under three years 0 1 G) In early cases a single dose may cure and granulomata usually disappear within ten days Two or three doses at weekly intervals may be required for tertiary cases and in chronic cases with gross destructive lesions weekly injections should be continued for three months

Bismuth The usual preparation is sodium potassium bismuth tartrate which contains 60 per cent of metallic bismuth It is given intramuscularly in doses of 0·15-0 3 G at weekly intervals and may be combined with arsenicals Bismuth salicylate can be used also Stomatitis is a troublesome side-effect

Management of a case of yaws. 1 *Leg ulcers should* be cleaned and dressed daily and the limb put at rest

2. For crab yaws the feet should be soaked in a warm sodium carbonate solution The hyperkeratotic skin is peeled off exposing the papillomata These are brushed with copper sulphate or perchloride of mercury (1 1 000) 2 per cent tartar emetic ointment may be used

3 Commence treatment with penicillin arsenic bismuth or a combination of these Penicillin alone is simpler and more efficient for mass therapy

4 Follow the response by repeated Wassermann tests When the reaction becomes negative repeat once monthly for three months then three monthly for one year If still positive after six months or relapse occurs the treatment course should be repeated

5 Treat any concurrent infection particularly malaria or ankylostomiasis

Relapsing Fever

An insect borne disease due to infection with a spirochæte The two main types are louse borne relapsing fever due to *Treponema recurrentis* and tick borne relapsing fever due to *T duttoni*

Treatment Tetracyclines chloramphenicol penicillin arsenic and gold have all been used

The antibiotics particularly the tetracyclines and chlor amphenicol are the most effective remedies but are safer if administered during an apyrexial interval They should be given orally 1 2 G on the first day and then 1 G daily for three to four days This dose usually prevents relapses At the onset of a bout of fever neoarsphenamine is very effective This drug is given intravenously in dosage of 0 01 G per kg body weight Gold (Solganal B Schering) has been tried in combination with arsenic especially in the tick borne fever which may be resistant to arsenic alone Initial dose is 0 01 G intramuscularly and the course should not exceed 1 G

Rat bite Fever

Rat bite fever may be separated ætiologically into two specific diseases the spirillar form caused by *Spirillum*

minus and the streptobacillary form caused by *Streptobacillus moniliformis* The disease may follow the bite of a rat or of animals which have been worrying them.

Treatment Both types respond equally well to penicillin streptomycin or one of the tetracyclines Aqueous procaine penicillin 600 000 units given intramuscularly once daily for seven days is sufficient As a prophylactic measure all rat bites should be cauterised

Yellow Fever

A mosquito-borne disease of international importance Vectors are various species of Aëdes for urban yellow fever and *Hæmagogus capricornis* for jungle yellow fever The monkey is an important reservoir of infection. The incubation period is four to five days and the official quarantine period six days persons showing fever on the sixth day are isolated In endemic areas the disease is usually silent, and manifests itself only in new arrivals who are non immune

The virus of yellow fever is present in the blood during the first three days of illness and can be cultivated in chick embryo media A pantropic strain 17 D is used for preparation of vaccine Being live it loses potency rapidly and distribution is difficult On injection the virus circulates in the blood but causes no ill-effects and it cannot be transmitted by mosquitoes It s fully protective from ten days after inoculation up to four years and should be given at least 10 days before arrival in a yellow fever area

The onset of yellow fever is sudden with rigor intense headache rising temperature and falling pulse rate vomiting is a prominent feature After a remission on the third day fever usually recurs and a critical phase develops, which is characterised by jaundice black vomit albuminuria and extreme prostration

Treatment. There is no specific treatment for this disease Complete rest in bed is essential and the patient should not be transported long distances. As much fluid as possible should be given if vomiting occurs 5 per cent glucose intravenously should be used. Anuria is a serious complication and requires appropriate treatment (p 194) Immune serum is of no value after the onset of fever

Control of yellow fever 1 *Local control* When a case of yellow fever occurs in an endemic area or is imported into a country where the vector is present the patient should be isolated in a mosquito-proof building and the disease notified immediately All living-quarters in the area should be sprayed with 5 per cent pyrethrum and the population inoculated

2 *National control* Endemic areas must be clearly defined and expert diagnostic service made available

3 *International control* The International Convention makes provision for preventing transfer of infected persons from one country to another and defines infected countries It requires effective spraying of ships and aircraft with pyrethrum just after leaving an infected country and just before arrival at destinations DDT should not be used on account of its delayed lethal action on adult mosquitoes

Dengue

An acute infectious fever due to a virus transmitted by the mosquito Aëdes It occurs in epidemics usually at the beginning of the hot season Onset is abrupt with high fever bradycardia post-orbital headache and pains in the bones The temperature falls but a second bout of fever is usual

Treatment is entirely symptomatic A vaccine has been used for prophylaxis but its value is doubtful Anti mosquito measures should be taken

Sandfly Fever

A virus disease and the vector is Phlebotomus It resembles dengue and occurs in epidemics After an incubation period of three to seven days there is sudden pyrexia with headache conjunctival injection and leucopenia Treatment is symptomatic and anti sandfly measures should be taken as in kala azar

Rabies

Once the disease develops clinically there is no known cure The patient should be kept in a darkened room At first barbiturates may be used for sedation but morphine may give more relief Spasms are controlled by chloroform

anæsthesia or curare tubocurarine chloride should be injected in 15 mg doses

Prophylaxis When a person has been bitten by a dog wolf jackal or bat in a country where rabies exists the following procedure should be adopted

1 Immediate cautery of the wound with pure ph nol The dog should be secured and a search made for other possible victims especially young children The animal must not be destroyed If it is well at the end of ten days anti rabic treatment of the victims may cease

2 If the dog has been destroyed by its owner remove the brain and despatch it to the laboratory for diagnosis of rabies

3 Commence anti rabic inoculations immediately A great number of anti rabic vaccines are in use They consist of a suspension of animal nervous tissue containing the fixed virus of rabies The virus may be either attenuated or killed Since the dose of each vaccine varies the instructions accompanying the ampoule should be followed Immunity lasts only three months Hyper immune serum (Lederle) is now available and in severe risk cases should be used with the vaccine Combined vaccine and immune serum therapy is especially indicated for bites involving the head or neck. It is considered most effective if used within forty-eight hours after the bite Since it is a horse serum product the usual precautions against serum sensitivity should be followed Anti rabic inoculations are painful and indurated areas may form at the injection sites Neurological complications may occur such as transient paraplegia and cranial nerve paralysis (especially of the facial nerve) Acute polyneuritis has been reported which is more serious Cortisone has been found to hasten recovery from these complications

Control Strict quarantine of potentially infective animals on importation to rabies free areas (6 months) Where the dog is the principal carrier good results have followed mass inoculation of the canine population with vaccine In countries where wolves and jackals spread the disease shooting and trapping are used Where the vampire bat is the vector the bat population must be kept down and the cattle vaccinated

Ankylostomiasis

Hookworm disease is a common cause of debility and anæmia in the tropics and it is due to infection with *Ankylostoma duodenale* or *Necator americanus* Treatment is similar in both infections but *Necator americanus* is more easily eradicated The larvæ of other hookworms such as *Ankylostoma braziliense* may cause ground itch in man without further development

The outstanding features of hookworm disease are anæmia and œdema of the face and legs Mild pyrexia is common and the abdomen is distended there may be retinal hæmorrhages and melæna

Treatment. *Tetrachlorethylene* The most useful drug for this disease Adult dose 4 ml for children 0 2 ml per year of age Administered in capsule form on empty stomach followed by a saline purge in 1½ hours May cause toxic jaundice and is contra indicated in nephritis and hepatic disease

Hexylresorcinol The crystals are administered in freshly prepared capsules of 0 2 G Adult dose is 5 capsules for a child 4 capsules and for children under six years 2 capsules No food or alcohol should be taken for four hours after treatment This drug is free from toxicity but gastro intestinal irritation sometimes arises Treatment may have to be repeated

Management of a case of hookworm disease 1 The most urgent indication is treatment of the inevitable anæmia and iron should be given For severe anæmia blood transfusion is indicated

2 When the general condition permits give antihelminthic treatment

Filariasis

Filariasis includes the following conditions

1 Infection with *Filaria bancrofti* Vector various species of anopheline and culicine mosquitoes 2 Infection with *F malayi* Vector the mosquito *Mansonoides* 3 *F loa* infection Vector the fly *Chrysops* 4 Onchocerciasis due to

Onchocercus volvulus Vector the fly *Simulium damnosum*
5 *Dracunculus medinensis* Vector *Cyclops*

F bancrofti and malayi infections

The microfilariæ gain entrance through the skin at the time of the mosquito bite and they show a characteristic periodicity in the peripheral blood being found only when the patient lies down The following manifestations may occur elephantoid fever abscess formation in regional lymph glands lymph scrotum elephantiasis of the legs and scrotum chyluria and chronic synovitis of large joints

Treatment *Diethylcarbamazine* (Hetrazan Lederle) Dosage is 6 mg per kg. body weight daily for twenty-one days by mouth Urticaria frequently follows

Management of a case of filariasis. 1 *Early cases not showing elephantiasis* The patient should be removed from the endemic area to prevent reinfection Elephantoid fever calls for cold sponging and calamine lotion should be applied to the inflamed lymphatics Abscesses must be drained and for lymph scrotum or funiculitis a supporting bandage is required If secondary skin infection appears sulphonamides or penicillin should be used A course of diethylcarbamazine is instituted

2 *Elephantiasis* Due in part to lymphatic obstruction but secondary infection and allergy are believed to have some influence Surgery is indicated in advanced cases Large scrota should be removed preserving the genitalia Large masses of elephantoid tissue are best excised

Loiasis. Clinical manifestation is the Calabar swelling and the adult worm may migrate to the eye For subconjunctival worms cocaine and adrenaline should be instilled the worm immediately transfixed with forceps, and a silk suture tied underneath The conjunctiva is then snipped with scissors the worm removed and the conjunctiva sutured If the worm eludes capture it can be made to reappear by sponging the eyelids with warm water

Diethylcarbamazine is the most specific treatment To avoid dangerous allergic reactions, begin with 100 mg and increase by this amount daily give 400 mg on fourth to tenth days.

Onchocerclasis

Common in West Africa but occurs in South America *Onchocercus volvulus* has been called the blinding worm as it is an important cause of iridocyclitis The adult worms live in nodules on the body surface and the microfilariæ have an affinity for the eye

Treatment All nodules must be removed under local anæsthesia in order to prevent eye involvement The best drug is suramin intravenously in five to ten weekly doses of 0 5 1 G It is particularly effective in ocular cases Diethyl carbamazine may also be used but is less effective

Dracontiasis

The guinea worm is acquired by ingestion of *Cyclops* (a small water insect) infected with the embryo of the worm The male adult worm is rarely seen but the female is of great length and inhabits the subcutaneous tissues Penetration of the skin usually occurs on the leg which is frequently in contact with water A supply of embryos can be obtained by allowing cold water to trickle over the point of exit of the uterus of the worm

Treatment There is no satisfactory chemotherapy The worm should be removed without sepsis The patient is put to bed to prevent swelling and accidental injury to the worm which will result in infection As soon as the worm protrudes tie a silk ligature round it and fasten to a small stick one turn of the stick daily will extract it The time occupied is about two months Sulphonamides or penicillin should be used if sepsis supervenes and incision may be necessary

The worm may be pemoved surgically by making a series of incisions across it pulling out loops with a hook and cutting them off

Prevention of infection Drinking pure water or boiling *doubtful supplies*

Schistosomiasis

Three schistosome flukes cause disease in man

1 *Schistosoma hæmatobium* Originally an African parasite it has spread to Palestine Crete and Portugal

Hæmaturia aggravated by exercise may occur Complica tions cystitis calculi hydronephrosis fistulæ stricture penile elephantiasis salpingitis and vesical carcinoma Other manifestations are bilharzial pneumonia dysentery (due to colonic involvement) and severe anæmia.

2 *Schistosoma mansoni* Found in Africa and N and S America Interlobular pipe stem cirrhosis of the liver causes ascites. An acute dysenteric syndrome and polyposis are common splenomegaly is marked Profound anæmia complicates African infections

3 *Schistosoma japonicum* Occurs in China Japan and the Philippines Causes severe cercarial dermatitis dysentery cirrhosis of the liver and splenomegaly

Treatment 1 *Tartar emetic sodium antimonyl tartrate* A specific cure Used as a freshly prepared 2 per cent solution intravenously by slow injection. Commence with 30 mg and increase by this amount on alternate days until 150 mg is reached A course consists of 2 G Toxic symptoms especially coughing and vomiting are common The other drugs unfortunately are less effective

2 *Lithium antimony thiomalat* (Anthiomaline M & B) Used as a 6 per cent solution intravenously or intramuscularly Commence with 0 5 ml and increase on alternate days until ⁓ 5 ml is reached The total required for cure is about 50 ml

3 *Stibophen* (Fouadin) This trivalent antimony compound is used in 7 per cent. solution intramuscularly The initial dose is 0 5 ml which should be increased on alternate days to a maximum of 5 ml A course consists of 50 ml

4 *Emetine* Useful in antimony resistant cases Commence with gr ¼ intramuscularly and follow with gr 1 weekly for fifteen to twenty doses

Management of a case of schistosomiasis. 1 Institute specific therapy preferably with tartar em tic Emetine may be better in *Schist jap nicum* infections Antimony should be used with extreme caution in cases showing liver cirrhosis pulmonary involvement or cerebral manifestations emetine is saf r in such circumstances.

⁓ Symptomatic treatment para entes s abdominis iron

Criteria of cure Intestinal amœbiasis is essentially chronic and negative stool reports are untrustworthy After treatment six consecutive stools are examined for cysts and repeated at three monthly intervals for a year Salines should be given to ensure liquid stools which must be examined while fresh

Management of a case of amœbiasis. Confine the patient to bed for the first fortnight of treatment If severe give fluid diet Treat bacillary dysentery if present Give a standard *course of drug treatment* During convalescence increase the diet but avoid roughage Perforation of the bowel requires surgical intervention

Amœbic hepatitis Chloroquine has proved superior to emetine The dose is 0 15 G base six hourly for four days then twice daily for eight days tailing off with one dose daily for nine days An antibiotic should be given concurrently A course of E B I or Diodoquin should follow to rid the bowel of residual infection If fever and leucocytosis persist in spite of this treatment abscess formation is likely and aspiration or open operation indicated

Bacillary Dysentery

Bacillary dysentery is an epidemic disease and its incidence is directly related to the fly season Complications are rare but in chronic and relapsing cases there is a tendency to the development of sprue Shiga infections are usually severe whereas cases due to the Sonne group are mild Flexner infections tend to be intermediate in severity

Treatment *Sulphonamides* The little absorbed sulphonamides are eminently successful in bacillary dysentery and *have ousted earlier methods of treatment The adult dose of* succinylsulphathiazole is 10-15 G in five divided doses daily for three days followed by one third to one half dosage for three to five days Phthalylsulphathiazole is used in dosage of 3-4 G daily for three days followed by half-dosage for a further three days Small doses of an absorbable sulphonamide e g sulphadiazine should be given as well

The *tetracyclines* sterilise the stools in a few days and are *especially useful for children These should be continued* until the temperature is normal for two days The total daily

dose of oxytetracycline for a child is 20 mg per lb body weight given in divided doses six hourly

Management of a case of bacillary dysentery 1 Absolute rest in bed Dispatch a specimen of stool or rectal swab for bacteriological diagnosis

2 Liberal fluids as in typhoid fever in severe cases intravenous fluids may be necessary Return to solid food must be gradual

3 Commence *antibiotic* treatment immediately

4 Symptomatic treatment Griping abdominal pain is best relieved by the application of warmth to the abdomen

For chronic cases preliminary sigmoidoscopy and bacteriological examination should be done as many are amœbic

Balantidial Dysentery

A rare disease caused by infection with *Balantidium coli* Pigs are a reservoir of infection and swine herds provide most of the cases

Clinically it produces a chronic intractable dysentery

Stovarsol 1 G daily by mouth for ten days is effective The tetracyclines (0 5 G every six hours for 10 days) are probably better

Cholera

An acute infection characterised by severe diarrhœa and vomiting associated with collapse water and salt depletion leading to uræmia Clinically the disease is divided into three stages (1) rice-water stool evacuation (2) collapse with cyanosis and dehydration (3) reaction marked by fever and re-establishment of urinary secretion.

Treatment Is essentially a matter of maintaining the fluid and electrolyte balance There is no specific treatment Sulphonamides are of doubtful value

Management of a case of cholera. A record of temperature pulse rate blood pressure and blood specific gravity should be kept

First stage 1 Ensure complete rest and maintain warmth by hot water bottles or electric cradles.

Give as much fluid as possibl by mouth.

Second stage 1 Give hypertonic saline intravenously (2 N sodium chloride) The infusion should be done slowly and

stopped temporarily if headache occurs The amount required varies with the blood specific gravity but it should be continued until normal (1058) is reached when isotonic saline may be substituted

2 If urinary suppression occurs the treatment outlined for this complication should be adopted (p 194)

Third stage 1 If the skin temperature exceeds 103 5 F cold sponging is indicated

2. Intravenous drip (glucose saline) may be continued or salines given by the rectal route

3 If the blood pressure remains below 100 mm Hg *l* noradrenaline should be added to the transfusion fluid (p 34)

Return to normal diet must be cautious and protein limited until renal function is regained Bed rest is maintained for two weeks after symptoms have disappeared owing to the danger of sudden collapse

Control of cholera 1 Protection of food and water from contamination A chlorinated water supply is safe provided it contains free chlorine Wells should be treated with bleach powder

2. Rigorous isolation of patients and disinfection of dejecta with 5 per cent cresol Feeding utensils should be boiled and soiled clothing etc soaked in 2 per cent cresol

3 Cholera inoculation should be given to everyone in the area or entering it Initial dose of vaccine (freshly prepared) is 0 5 ml (4 000 million) followed in ten days by 1 ml subcutaneously The resultant immunity lasts about six months and is by no means absolute

Leprosy

This disease is now confined almost entirely to tropical climates although small foci remain in Europe *e g* Norway *It may* be acquired in many ways—by skin contagion or by infection of the nasal mucosa Flies may disseminate infection *Infectivity is not high*

Nodular leprosy commonly affects the face The nodules ulcerate and discharge infectious material Nerve leprosy is characterised by areas of anæsthesia and skin lesions due to

lepromatous involvement of nerve trunks The ulnar nerve is usually thickened Diagnosis is made by examination of nodular discharge skin sections or nasal smears The Wassermann reaction may be positive

Treatment *Dapsone* (DDS) The standard therapeutic agent which has replaced its disubstituted derivatives such as solapsone whose action depends on the DDS they form in the body It is rapidly absorbed and slowly excreted. The dosage schedule is 100 mg. twice weekly orally during the first month 100 mg three times weekly during the second month and 100 mg four times weekly during the third month Reduce the dosage if reaction or anaemia occurs but continue for at least two years ACTH or cortisone is useful in treating severe lepra reactions Hydrocortisone eye drops (1 per cent) are of value in the treatment of acute leprous ocular reactions

Thiosemicarbazone and *streptomycin* are used to supplement DDS or replace it for a time The adult dose of TB1 is 100 mg. daily for six days during the first week, and 200 mg daily for six days each following week allowing an interval of fifteen days each month It is effective in healing chronic skin lesions Streptomycin suppresses ocular inflammation

Chaulmoogra The oil may be given by mouth in doses of 15 minims, gradually increased to 1 drachm. This drug is now seldom used since better results are obtainable with modern chemotherapeutic agents.

Plague

Plague is primarily an enzootic disease of rats and is transmitted by the rat flea *Xenopsylla cheopsis* The human flea *Pulex irritans* can maintain infection from man to man. Bubonic plague manifests itself by sudden high fever vomiting and mental confusion, and the condition may resemble typhus. The spleen is enlarged and a bubo occurs if suppuration supervenes, healing of the bubo will be delayed for about one month The onset of pneumonic plague is also abrupt with fever cough, dyspnoea and cyanosis. The mortality is high Diagnosis is confirmed by isolation of *Pasteurella pestis* from blood, buboes or sputum.

Treatment *Sulphonamides* Sulphadiazine is the most effective preparation 4 G should be given at the outset and may be divided between the intravenous and oral routes Thereafter 0 5 G is given four hourly until the temperature becomes normal At least four pints of fluid should be taken daily during this course In fulminating septicæmic cases the initial intravenous dose of sulphadiazine should be 0 1 G per kg. body weight repeated in six hours Glucose saline by intravenous drip is also useful

Streptomycin Intramuscular injection of 0 5 G six hourly until the temperature settles thereafter twice daily for five days Chloramphenicol or the tetracyclines may be used in combination with streptomycin

Anti plague serum Should be used in the early stage in dosage of 30-40 ml into vein or muscle Results are variable

Management of a case of plague 1 Isolate the patient and disinfect his clothing by steam or 10 per cent DDT powder

2 Nurse in a well ventilated room or ward An aperient is useful at the outset For delirium cold sponging is soothing but morphine should be given if necessary

3 Commence sulphadiazine streptomycin therapy Serum may be given also

4 Apply ice bags to the bubo glycerin and belladonna helps to relieve pain Suppuration is met by incision

Control of plague 1 Strict isolation of cases in plague hospitals Nurse pneumonics in a separate ward Attendants should wear vermin proof garments and the staff and all contacts should be vaccinated

2 During an epidemic it may be necessary to evacuate an area after disinfestation of the population Ten per cent mixture of DDT in talc is used for flea control

3 Movements of individuals out of an infected area should be limited and subject to production of a valid vaccination certificate and to dusting with DDT Merchandise particularly cotton and rags must be disinfected before despatch from the area

4 Rat control Rats can be destroyed by traps or poison

Brucellosis

An infection characterised by numerous pyrexial relapses with headache joint pains and leucopenia Drenching sweats occur with each defervescence and the spleen may be palpable In children it may take the form of an obstinate and featureless pyrexia Three organisms cause this disease (1) *Brucella abortus* which naturally infects cattle and is found in cows milk (2) *B ucella melitensis* which is trans mitted by goats milk (3) *Brucella suis* which is transmitted to man by handling infected pork Infection can occur through the skin and farmers veterinarians and abattoir workers experience a high incidence

Treatment The tetracyclines are sometimes effective in dosage of 2 G daily for twenty-one days The addition of intramuscular streptomycin 1 G daily for the first two weeks may increase the cure rate After cessation of treat ment relapses are frequent in which case the treatment course should be repeated Gost reports excellent results from novobiocin (Cathomycin Merck Sharp & Dohme) 0 25 G orally four hourly until the day after defervescence and then six hourly to a total of 18 G

The Typhus Fevers

The following varieties are recognised 1 *Classical typhus due to Rickettsia prowazeki* and transmitted by the louse *Pedicu us humanus* The patient s serum agglutinates the OX 19 strain of Proteus 2. *Murine typhus* (Brill s disease) transmitted by the rat flea it is essentially endemic 3 *Tick typhus* of which there are many types such as rocky mountain spotted fever caused by *Rickettsia rickettsi* and transmitted by the tick *Dermacenter and rsoni* and *fièvre boutonneuse* transmitted by the dog tick *Rhipicephalus sanguineus* 4 *Mite-borne typhus* (scrub typhus) due to *Rickettsia orientalis* and transmitted by mite larvae

Classical Typhus. World wide distribution and epidemics are common in conditions of war and famine Infection is acquired by contamination of louse bites or scratches by faeces or body juices of infected lice The onset is sudden with rigors, headache vomiting and fever The rash appears

on the fourth or fifth day delirium tremors and deafness are common

Treatment Chloramphenicol is specific Give an initial oral dose of 3 G then 0 25 G at three hourly intervals The tetracyclines have also given good results Dosage 2 G orally followed by 0·5 G six hourly

Control of classical typhus. Two vaccines are available (*a*) Cox s (killed *R prowazeki*) 1 ml weekly for three doses Reduces the severity of the disease (*b*) Blanc s (live vaccine prepared from dried flea fæces) dose is 1 ml May cause mild murine typhus in some cases During epidemic pre valence vaccination should be general It is specially im portant for personnel of isolation hospitals They should be provided with vermin proof clothing and be dusted with DDT weekly

Sprue

Sprue affects white residents in tropical countries but is rare among indigenous populations It may not arise until after many years tropical residence and may be silent until the individual has returned to a temperate climate Chronic dysentery is an important predisposing factor and there is a background of vitamin B lack Prominent features are macrocytic anæmia steatorrhœa with excess of split fats loss of weight and sore tongue Remissions are characteristic and tetany may occur in severe cases

Management of a case of sprue 1 Keep the patient in bed and continue with his usual diet until the diagnosis has been confirmed A fractional test meal full blood count and fæcal fat analysis should be done

2 Prescribe a diet rich in protein and vitamins but poor in fat Milk is well tolerated and lean meat chicken and eggs are acceptable Fruits may be given freely Carbohydrate is added later Gluten free bread should be used if available

3 Injections of a crude liver extract (Plexan Glaxo Campolon Bayer) 2 ml daily intramuscularly for two weeks and then 2 ml weekly until the erythrocyte count reaches normal This need not be continued indefinitely as in pernicious anæmia but relapse must be met by further injections Vitamin B_{12} may be effective

4 Folic acid given in dosage of 15-30 mg daily causes considerable symptomatic improvement but may not correct the anaemia

5 Nicotinic acid amide 100 mg and riboflavine 5 mg. daily are useful for sprue mouth and tongue

6 Antibiotics or adrenal corticosteroids may be temporarily helpful in some cases but their prolonged use is probably harmful

7 If tetany occurs give 10 ml of 10 per cent calcium gluconate slowly intravenously Bleeding due to hypoprothrombinaemia is corrected by vitamin K or its analogue menaphthone 20 mg intramuscularly

Sprue sufferers should leave the tropics permanently

Snake Bites

Snake bite is a common occurrence in tropical practice and remedies should be readily available as the outcome depends on early treatment When examining the wound *look for two fang punctures which indicate the bite of a* poisonous snake Bites from colubrine snakes (cobras and kraits) cause death by paralysis and asphyxia Cobra venom is also haemolytic, and haemoglobinuria may occur Bites by viperine snakes (Russell's viper and rattlesnake) cause swelling and petechial mottling of the limb also nausea vomiting and syncope

Treatment of snake bite 1 If the snake has been killed secure it for identification

2. Apply a tourniquet at the top of the affected limb and this may be kept in position for twenty to thirty minutes.

3 Inject antivenin at a distance from the wound Antivenins are available against viperine and colubrine bites, also polyvalent preparations They may be used intravenously or intramuscularly The required dose is in inverse proportion to body weight and the dose for a child is several times that required for an adult The usual adult dose is 100-300 ml

4 Suck as much venom as possible out of the wound and incision may be a desirable preliminary Permanganate application is of little value and cautery is contra indicated.

5 Keep the patient quiet in bed Black coffee or caffeine may be given but morphine is harmful.

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